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Vol. VI. NEW YORK, DECEMBER 26, 1885. No. 26.

Our esteemed French contemporary, *Cosmos*, appears to approve the word "telectroscope" proposed by us to describe the apparatus for seeing by electricity. French taste in these matters, as in so many others, is good.

SOME idea of the extent to which the newspapers of the country support the telegraph lines is given by the fact that the total quantity of press telegrams sent over the Western Union lines reaches more than a thousand million words a year. This astounding total would be largely increased if the figures of the other telegraph companies were included. The wonder is that the newspapers have not combined to operate a telegraph system of their own, including a cable, and doing work with it for the public as well. That would be better than governmental control.

THE mechanical telephone would appear to be in the field as a rival to the electric telephone, and, judging from our article in another column, it would be well for our electric telephone friends to keep an eye on the newcomer. With the establishment of a successful mechanical telephone exchange, the problem of acoustic telephony will have reached a stage of considerable importance. Still, for long distances, it cannot compete, for all work, with the electric telephone, which alone can convey the human voice intelligibly over long distances. And this reminds us that nothing has for some time been heard of the experiments in long-distance telephony.

ON another page will be found figures from most of the electric lighting companies, showing what they have done during 1885. We think that the figures are a splendid answer to the unfair and baseless attacks recently made on electric lighting by one of our contemporaries. The year was one of dullness and depression until its close, when, of course, it was too late for the electric lighting business to benefit by the stimulus so as to show in these returns, and yet, with one or two prosperous companies to hear from, the results exhibited are of the most hopeful, bright and cheering nature. Here is amazing growth under adverse circumstances, growth, too, that is still in its shortest strides.

THE practical applications of the wonderful properties of the selenium cell are constantly widening in their scope. A recent German invention, involving its application in submarine telegraphy, is another instance of this. But although this is a new disposition of the apparatus, the idea is not a new one; in fact, as early as 1881 several plans for the utilization of the cell in connection with submarine telegraphy were proposed. Although the arrangement seems a practicable one, we are not aware that it has been actually tried, so that a practical test must demonstrate its usefulness. As another instance of the employment of the selenium cell, we might mention its use as a register of fares. A recent patent described a contrivance in which the passenger was obliged to pass between the cell and a lamp. As the light of the latter is interrupted, the cell acts so as to close a local circuit, and the fare is registered. A hint to the wise is sufficient, and our inventive readers will have no difficulty, we think, in devising applications of the wonderful selenium cells.

A MONTH or two ago we suggested that it might be worth the while of some of the electric light companies to see what could be done in the way of lighting blocks of private houses. We are now glad to note that an effort is to be made in England to give the idea a trial. The Anglo-Brush Company asks small groups of householders to unite in a joint local installation for, say, half a dozen houses, the cost of installation per house to average not more than $500. The installation is to include steam or gas engine, dynamo and sets of secondary batteries. It would be very interesting to watch the plan carried out in various places and then to study the results. The only similar attempt we know of in this country is that made by Mr. E. H. Johnson, who, from the Edison plant in the cellar of his house in East Thirty-sixth street, this city, proposes to furnish light to several of his neighbors. It is possible that Chicago may have one or two instances of this kind, the Edison system being also used for them, but Mr. Johnson's will in many respects stand alone as an ingenious adaptation of means to ends.

THE wisdom of providing for the electric lighting of the proposed Nicaragua Canal is shown in the recent excellent results obtained on the Suez Canal. The experiments there made are not complete by any means, but have thus far proved so successful that it is intended to allow vessels to pass the canal by night after the first of January next. All kinds of vessels are, however, not to be permitted to pass, the privilege being reserved for war-ships and mail steamers carrying the requisite electric lights to navigate that portion of the channel between Port Said and the fifty-fourth kilometre. These vessels represent about 22 per cent. of the whole traffic. This will constitute a great saving of time, and M. de Lesseps hopes that the trial will be so successful that he will be enabled in a short time to authorize all kinds of vessels to pass by night. Each vessel going through has to carry an electric light destined to light up the canal for 1,200 metres, or about three-quarters of a mile ahead. Here is, therefore, an additional incentive for all vessels to carry electric lights, for the cost of the entire plant may almost be counterbalanced by the time saved in a single trip.

NOW that the American Cable stock has been stricken from the Stock Exchange list on a dispute about some technicalities of certification, would it not be a wise thing to inquire into the actual value of the stock aside from the Western Union guarantee? After all, there may be good reasons for laying new cables. Are the American cables now worth anything intrinsically? How much actual work do they do in a year? How much longer can they do any work? Does not the expense of repairing them overlap the return they yield when useful? We have a suspicion that more may be behind this dropping of the stock from the list than appears on the surface, and that while American Cable may still be a name it is only, like the Mutual Union, a dividend-drag on the Western Union and a bogey to scare other companies with. As we have just remarked, the whole matter of these cables might profitably be looked into by newspapers in want of a sensation, or capitalists desirous of knowing how far the nominal cable capacity represents the capacity of cables still operative. Has Mr. Stokes found out something that tempts him to go into his new cable enterprise?

THE newly invented electric furnace of the Messrs. Cowles, of Cleveland, has already yielded such marvelous results that its future products may well be the subject of speculation. If we may be permitted to make a suggestion in the matter, it would be to seek a method of making diamonds by this process. Probably, with suitable simple arrangements, the pure carbon in the incandescent furnace could be volatilized and made to crystallize out in the presence of appropriate reducing agents. It was claimed, some time ago, that real diamonds in small crystals had been artificially prepared, but nothing has since been heard of the project. The process, too, was a difficult one. The electrical furnace, however, seems to offer an excellent means of experiment in this direction, and we hope that the subject may be taken up in earnest. Some day a combination of circumstances may lead to an accidental formation of the diamond in the furnace, and then it will be necessary to study the causes leading to this result. It may appear as visionary, but we certainly should not be surprised to hear of the formation of diamonds in the electrical furnace, which affords the means for imitating the processes by which nature has turned out from her laboratory the Koh-i-noor. Electricians had better sell out their diamonds now before the market is glutted with the manufactured article.

ONCE again we have to protest against the circulation of that absurd item crediting Russian engineers with telephoning a distance of 2,465 miles. It was alleged at first in the wandering item that they talked from St. Petersburg to *Bologna*, in Italy. Now, no less an authority than the *Mail and Express* of this city makes the two points St. Petersburg and BOULOGNE. We therefore seize the opportunity to state that the engineers talked only between St. Petersburg and BOLOGOE, and that the distance was somewhere near 400 miles. Seeing that the item started on its rounds fully two years ago and originated in the endeavor of one of our exchanges to mend the spelling of BOLOGOE in the report which was first communicated to our columns by Mr. Crawford, a well-known American telephonist, then in Russia, we think it is about time that the real facts were given a little publicity. We have made the correction before, pointing to the item as it stands in our pages, and now we would like to have the kind help of some of our contemporaries in starting the truth on its rounds. We should be glad to have the assistance of the *Mail and Express*, it being the latest to "pass on" that marvelous yarn. The whole case is a remarkable exemplification of the persistence and long life of error, even in these days of wide-spread publication and a vast reading community. The statement, untrue on its very face, has been printed without challenge by any number of our contemporaries, including the leading scientific papers of both hemispheres.

ALTHOUGH the electric light has found no difficulty in establishing itself as a mill illuminant, there are still some who unthinkingly claim its cost to be too high. The electric light, however, has not only been shown to be more economical in direct cost, as it may be called, but has a value peculiar to itself. The introduction of electric illumination into textile mills, for instance, has been followed by some of the most favorable results, both in regard to the quantity and quality of the manufactured goods, and also the health of the operatives. Hence, as an English contemporary points out, the value of light in mills is not to be measured by its cost, but by its worth in contributing to the production of the mills. Within late years mills have been constructed with high rooms and broad high windows, in a manner which incurs additional expense for no other reason than to obtain a better distribution of sunlight. On some classes of figured cloths it is considered that goods manufactured in summer stand higher in the market than those made during the winter months, when the short days require more artificial light, when by reason of the less thorough illumination, a greater proportion of imperfect work is made. The introduction of the electric light in mills has been followed by numerous favorable results in regard to the principal matters involved in its consideration. The ability of concentrating upon fine or colored work any desired amount of light of a quality capable of disclosing shades of color, yields its result in the character of the work produced. The use of the electric light being unattended by any heating or vitiation of the air of a room has conduced in a material degree to improve the physical condition of mill operatives, and as a result of better health, they have been able to constitute a more perfect working organization, whether consideration is given to the slight ailments that merely interfere with the power of continuous labor, or to greater difficulties sufficient to incapacitate persons from work for days at a time. These arguments are well put, and cannot but demand the attention of all who operate mills.

On Telephone Systems.*

BY PROF. A. E. DOLBEAR.

The subject of the telephone is not so old as some other subjects that might be named, but within the past ten years it has engrossed so much attention in the way of experiment in all civilized countries, and has been the text for so many discourses, that it is hard to find anything that shall be new to such a body of listeners as I have before me. I cannot hope to add to your knowledge, and my aim will therefore be to summarize the principles that underlie telephony, and the methods that have been adopted in developing it.

I would first remark that when any physical end is to be reached, there are certain physical conditions which must be recognized, viz.: the laws of matter and of energy. There can be nothing accomplished in the physical world without it. Matter always is subject to its own laws, and the relations of matter to energy are such that no transformation of the latter ever takes place except through the agency of matter. Indeed it would be true to say that the body of physical science is made up of statements of the conditions under which energy is transformed.

We may call these the laws of nature; they are the conditions under which we live, and to which we must conform, for a physical law can never be traversed. A balloon rises in the air, not in spite of gravity, but on account of gravity. The pressure of steam is due to molecular impact, and if the molecular velocity be great enough the boiler bursts. If the railroad train is to be run fast, there must be no short curves in the road, for Newton's first law threatens disaster to such a combination.

Physical relations or laws, then, are fundamental, and every working machine works in accordance with them, whether the maker understood those laws or had them in mind or not. In the days when the commonly-held theory of heat was what is now known as the caloric theory, the steam engine worked just as it does now, and the development of the kinetic theory of gases and a clearer understanding of heat phenomena has not affected the motion of a single molecule. Clearly, then, individual *intention* has nothing to do with physical laws involved in any piece of mechanism.

All mechanical devices embodying energy are either transformers, transferrers or governors. A furnace is a *transformer* of the chemism of coal and oxygen into heat. The boiler is a transferrer of heat to the water, endowing it with greater molecular energy. The engine is a transformer of the heat energy into visible mechanical, rectilinear and rotary motions; while the main shaft is again a transferrer of rotary energy to the distant room, where, through the agency of pulleys and belts, the transformations are chiefly such as change the character or direction of motion, converting rotary into reciprocating motion, or *vice versa*, etc. In like manner, a galvanic battery is a transformer of the energy of zinc and acids into electrical energy. The leading wires are transferrers, conducting the electrical energy where it is needed, while the relay or sounder is again a transformer of the electrical energy into mechanical motions of an armature which may record its own movements, or the latter may be interpreted at once by an experienced listener. If a Morse key be put in such a circuit, it is as a controller of the transformations, and, of course, of the transferrence as well. It neither adds to or subtracts from the energy; it simply controls it. So long as the Morse key is manipulated by hand, the electric energy available is subject to the will of the operator, only, however, in its *rate of delivery*, not as to its generation, its velocity of transmission or its transformations in the sounder. Those are the physical relations which are beyond the reach of any intention and could not be changed by any will or wish the manipulator might have. It is, however, possible to make an automatic governor or key which shall so control the electricity as to produce a set of signals similar to those made by hand, but this automatic device is built upon physical principles, has its own laws of working, and *while it is working* is not subject to any one's dictation, or will, or wish. If it does its work properly it is because it is made in accordance with the laws of matter and of energy which are concerned in its working, whether the maker knew all those laws or not. It is as true for such a piece of mechanism as for a boiler injector or the governor of a steam engine. These principles or laws are simply *adopted*, not adapted. The mechanism is always *adapted* to the principles or physical laws which are to be operative, and it is right that the distinction between physical laws and the apparatus through which transformations of energy or the control of energy are possible should not be lost sight of, for I have known where the statement of the recognition of a physical law in the sense in which I have described it has been made as a claim upon the physical law itself. The law has allowed it and the court has awarded it.

What, then, are the physical conditions which underlie the electric transmission of speech? Speech, articulate speech, consists of sound vibrations in the air, generally of a highly complex character. The sounds themselves are partly arbitrary and partly automatic; that is, what I call a tree, a Frenchman would call l'arbre and a Chinaman something else. So much is purely arbitrary; but there is a difference, a physical difference, between my word tree and your word tree which no amount of painstaking on my part could make identical. The character of my voice is not subject to volition; it is as automatic as the sound of a violin or of a cornet, and that for the reason that the instrument that produces it is a physical instrument having its own laws of vibration and resonance. The pitch may be varied but not the quality, and so it is for a cornet or violin. Articulate sounds are the arbitrary ones, and have no particular character like musical instruments; no particular series of harmonics belongs to speech, but articulate sound vibrations in air involve *energy* and can only be maintained by the expenditure of energy, and any question of the transference of such vibrations from one point to another is simply a question of energy. If the distance be not too great, there may be enough energy in the vibrations in air to affect the auditory nerve of a listener, and no transformation will be needed. If the sound waves are prevented by a tube from spreading spherically in space, the energy will not be so wasted and the sounds be heard at a greater distance; but there is a limit there, and if speech is to be rendered at a greater distance, apparatus for transformation and transference must be employed. If electricity is to be employed, then the relations, if any, between sound vibrations and electrical phenomena must be employed. We might be supposed to know that electricity quickly distributes itself in a metallic circuit, and also that a Morse key enables one to send electric pulses at will through an electric circuit. But a key that will respond to sound vibrations *must necessarily be automatic*, for no hand can move with the rapidity and variety of sound vibrations. When sound vibrations fall upon any surface they impart a portion of their energy to it and cause it to vibrate in a similar way. One may whisper close to a closed door and be heard by one whose ear is against the other side of the door. The smaller and thinner the surface against which such sound waves spend themseves the greater will be the amplitude of the movements. Let such a surface capable of responding to any sound vibration be provided with freely moving electric terminals, so that every vibration shall send into the wire a corresponding electric impulse or wave, and we have a device that will do for speech in an automatic way what the Morse key will do when manipulated by hand; namely, vary the strength of an electric current in the circuit in accordance with certain arbitrarily chosen symbols. Such a device is now generally called a transmitter, but in reality it is an automatic governor, as its function is to control an electric current operated by the variable energy of sound waves. So far as the apparatus described does what has been said, we have an electric circuit in which the electric energy is a variable quantity depending upon the vibratory movements of the tympanum, and this may be from the maximum quantity which the provided conditions permit to nothing, if the current be entirely broken.

With the Morse key this range is reached for each signal; with the other, the range cannot be so great without danger of omitting some of the vibrations that constitute the sound. The sound vibrations in the air are a series of continuous waves so long as the sound is being produced. If the velocity of sound in air be, say 1,125 feet per second, and if a sound of any kind be produced for, say one second, then the first wave will be 1,125 feet from the last wave, and between them will be an unbroken series of similar ones. If such a series had acted upon the terminals of the electric circuit, the same unbroken series of electric waves would have been produced.

WHAT IS A SYSTEM?

A system is a series of steps or processes employed to attain some end or accomplish some purpose. Some things may be done with a single movement, yet there are few things that may not be done in more than one way. A tree may be cut down with an ax, or sawn down either by hand or by a circular saw run by steam, or it may be burned off by a platinum wire made red hot by electricity, or it may be gnawed off by beavers.

If time is to be kept it must be by some *uniform movement*, which may be secured by a pendulum or balance wheel, each in train with a set of gears and a weight or a spring. The end attained is the same, but the steps are different; and these may properly be referred to different systems or methods. Uniformity of action is the physical necessary condition for time-keeping, but uniformity of action is not a method of time-keeping.

If the early maker of a pendulum clock had said, "I have discovered that in order that time should be kept it is necessary to have a uniform, mechanical movement, and I have invented a pendulum to effect this; I therefore claim the method of and the apparatus for time-keeping;" if some patent office had granted such a patent, and if the courts had upheld the claim, the case would be paralleled by the celebrated fifth claim of the famous telephone patent of 1876. It might be true that no one had stated the condition so tersely before, yet the clepsydra embodied the proposition, and astronomers had predicted eclipses on the basis of uniform motion for time-keeping for thousands of years before.

Morse proposed a telegraphic system consisting of a battery, a key, a transferring wire and an electro-magnet with a movable armature which should record its movements. Not one of the steps was original with him. He invented neither battery, nor key, nor conducting wire, nor electro-magnet, but he combined these in such a way as to produce valuable results at distances which had not been reached before. Bain proposed a telegraph system in which a battery, a key, a wire and an electro-chemical instrument were employed. Neither of these steps did he invent. The differences were briefly that where Morse employed magnetism and its chemical relations, Bain employed chemism and its optical relations. One embossed paper, the other made a blue mark upon it. But the differences were deeper than this, for the battery power needed to do the work was much less in Bain's than in Morse's, and, moreover, there is a limit to the speed with which an armature of a magnet can move, and therefore, a limit to its telegraphic speed; but there is no such limit to the speed of such chemical reactions. Indeed, the only reason I ever heard for the abandonment of Bain's system was its unnecessary delicacy. In each of these systems the electricity which was to do the work was fitted at the transmitting end for the work it was to do at the receiving end, and the movements of whatever sort at the receiving end had corresponding motions of the key. Then there was the dial system of telegraphy, wherein a finger moving round a dial caused a similar movement of a finger about a receiving dial. In each and all systems it was recognized as a physical necessity that if electricity was to do a certain work it must be fitted for it at the transmitting station.

If dots and dashes are wanted they must be made at the transmitting station. The wire is employed simply as a transferrer, not as a transformer, and if it has such a transforming property its efficiency as a conductor is so much impaired, the amount of energy it can transmit in a given time is less, and the characteristics of the energy are more or less effaced.

It is not then singular to the telephone that the characteristics of the energy needed at the receiving end should be given to the electricity at the transmitting end, but on the contrary it is the physical condition that underlies all electrical apparatus whatever, and depends solely upon the laws of the transformation and conservation of energy, and must be conformed to as any other laws must. To give a new crook to a magnet or vary the relations of mechanical details in a transmitter and call them a new system is to me as ridiculous as it would be to paint the parts some different color and then christen it a new thing. That is not saying but that such changes may be improvements, but so long as the series of changes is precisely the same from beginning to end in both transmitter and receiver, I do not recognize the appropriateness of calling anything a new system. A different set of changes involving different transformations of energy, different laws requiring different apparatus, I do call a different system, and these must belong to both transmitter and receiver.

In conformity to this, what are the possible ways by which sounds of any sort may be electrically transmitted and reproduced at another place?

1st. As to the so-called transmitter or the device for fitting the electric energy for the work it has to do. There are two ways in which electric energy in a given circuit may be controlled, (I.) by varying the resistance and (II.) by varying the electromotive force in it. If there be any third way, I do not know of it. If then, the energy of sound waves can be so utilized as to vary the resistance in an electric circuit in conformity with the varying phases of the sound waves, we shall have one method; and as there is to be no transformation, it is evident that the action will be wholly mechanical, for the sound vibrations themselves are but mechanical movements in an elastic medium, and if there be no transformations the last term of the series will be mechanical in the same sense.

If sound energy can be made to vary the electromotive force in a circuit without changing the resistance in the circuit, then we shall have another and a different kind of transmitter. The discovery of magneto-electricity made it possible, and some of the very first magneto-electric experiments pointed out the way, namely, the generation of electric currents by means of the motion of the armature of a magnet.

2d. As to receivers. The range of possible receivers is not restricted as is that of transmitters, and a great number of ways of utilizing the electrical energy that has been properly adapted by a transmitter have been devised. It will be well here to recall the various effects which electricity is competent to produce.

I. Electricity is competent to affect a magnet which tends to set itself at right angles to the wire through which the current flows. Ordinary galvanometers are constructed to utilize this action of electricity.

II. Electricity is competent to produce a magnet, and upon this property the common electric telegraph and hundreds of other applications have been founded.

III. Electricity is competent to decompose compound chemical substances, as for instance water; and for the utilization of this property of electricity, a common and simple one is the production of a blue mark by means of the decomposition of the ferro-cyanide of potassium, as in Bain's electric telegraph.

IV. Electricity is competent to deposit one metal upon another metal, and from this property has grown up the great industry of electro-plating.

* Lecture delivered before the Franklin Institute, Dec. 11, 1885.

V. Electricity is competent to produce heat. The highest temperature which man is able to produce at present is that in an electric arc, and is used for the fusion of refractory substances, such as platinum, gold and steel.

VI. Electricity is competent to produce light, and the two systems of electric lighting, namely, that by the arc and that by incandescence, are developments of the possibilities in that direction.

VII. Electricity is competent to reduce the friction between bodies, and this property has been utilized by Edison in one of his telegraphic systems.

VIII. Electricity is competent to produce either heat or cold at a junction of metals, according as the current flows this way or that, which is known as Peltier's phenomenon.

IX. Electricity is competent to produce various physiological effects, and is extensively used as a therapeutic agent.

X. Electricity is competent to give a torsional strain to a conductor through which it flows either right-handed or left-handed, according as the current is towards or away from the observer. This has been used to measure the strength of the current flowing through the wire as a kind of galvanometer.

XI. Electricity is competent to produce very various gaseous phenomena, and a visible motion of paddle wheels, by the impact of gaseous molecules as is exhibited in various forms of Crookes tubes.

XII. Electricity is competent to twist a ray of light in air or other transparent medium, but this is at present used so far as I know only in the investigation of physical phenomena among molecules.

XIII. Electricity is competent to produce in the non-material substance called ether a certain condition which is generally known as the electric field, a field within which various interesting phenomena are manifest and which are at present the subject of investigation by physicists.

XIV. Electricity is competent to produce a noise or sound by disruptive discharge, as in the phenomena of thunder-storms and on a small scale by electric machines and Leyden jars.

XV. Electricity is competent to produce attraction, but this phenomenon, which has been known perhaps longer than any other of an experimental electrical kind, has not been utilized to any considerable extent.

It is not improbable that there are other things which electricity will do which I have not enumerated, or that will hereafter be discovered. It is possible to make nearly every one of these effects available in a telephonic receiver.

It is not my intention to undertake any settlement of historical matters in connection with the telephones, nor to enter upon any questions of priority, and the names which I shall employ to designate the different systems I describe I only adopt for the sake of distinctions which exist; and these can be more easily kept in mind if so individualized han in any other way.

(TO BE CONTINUED.)

Cheap Sodium by Electricity.

The manufacture of cheap sodium by an electrolytic process has been announced in France. An engineer of Lyons, M. Lossier, states that he will soon be in a position to sell sodium in large quantities at a price of about 25 centimes per kilo.—not much over one penny a pound. There would be no necessity for such an extremely low figure to be reached to insure a very large demand for the material. The process of M. Lossier consists, it appears, says *Engineering*, in decomposing, with an electric current, the chloride of sodium at a temperature of 900 deg. C., and it appears incredible that by any such process the price named is not absurdly low. In France, indeed, sea salt, which costs about 2¼ centimes the kilo. to obtain, is sold wholesale at 10 centimes the kilo., the duty being considerable. It appears that 3 kilos. of salt are required to produce 1 kilo. of chloride of sodium. It follows that, at current prices, the sodium not extracted from the combination is worth 30 centimes the kilo., to which must be added the cost of fuel for melting and heating the salt, the expense of producing the current, general expenses, profits, interest and depreciation, which would be extremely high. The price of 25 centimes appears, therefore, to be far too low, even if the salt be valued at the prime cost of production. It may be remarked that marine salt is at once one of the cheapest and most abundant materials known in commerce. If we assume a moderate area and depth of that portion of the globe covered by the ocean, the quantity of salt that it contains is estimated at six times the volume of the Alps. Unlike coal, marine salt is absolutely inexhaustible.

A "Mechanical Telephone" Exchange System.

When the Bell telephone had ceased to be a curiosity, and became a practical instrument in everyday use, the field of oral communication at a distance was opened to the world. The great success of the electric telephone, however, set many wondering whether communication over short distances could not be accomplished without electricity, and the old lover's telegraph obtained a new lease of life. A large number of mechanical or acoustic telephones have been constructed upon this principle, and with varying success. But more recently some decided improvements have been made, which have, we believe, put the mechanical telephone upon a sound basis of practicability.

Heretofore these mechanical telephones have been used as a means of communication between individuals on private lines only, but we now have to announce, for the benefit of our telephone readers especially, that a very ingenious central office system has been devised by Mr. Geo. F. Shaver, the President of the Consolidated Telephone Company, of Jersey City, N. J. By means of very simple arrangements any two subscribers can be put in communication with one another and in a very short time.

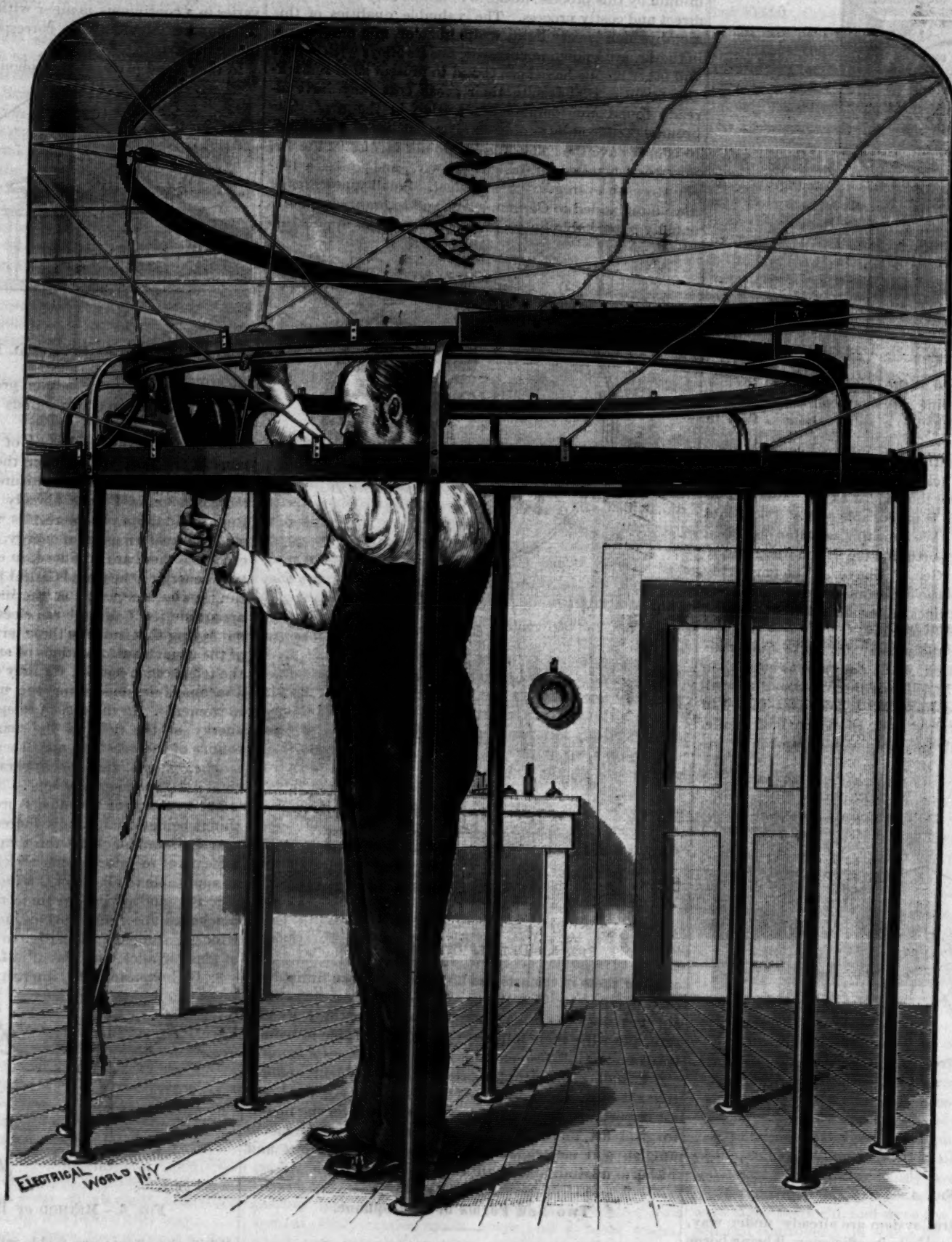


FIG. 1.—"MECHANICAL TELEPHONE" EXCHANGE—CENTRAL OFFICE.

The telephone itself, shown in Fig. 2, consists of a diaphragm which is stretched taut by a wire-truss forming the outline of a cone behind the diaphragm. The line wire is attached to the apex, and means are provided for preventing the "humming" due to vibrations of the wire caused by the wind.

The central office, which has but recently been put into practical working order, is shown in perspective in Fig. 1. The tower in which the exchanges are designed to be built is shown in sectional elevation and plan in Figs. 3 and 4. The lines are brought in from all directions and enter the walls of the tower. Within, there is placed a circular rack, upon which the operator's telephone travels in a circle; and above this rack there rises spirally a band of iron, perforated as shown in Fig. 1.

As each line enters the walls of the tower, as shown at *A*, Fig. 5, it is secured to a small diaphragm of leather or canvass, *D*, and ends in a button *E*, which prevents pulling out. From this point the line is extended to the switching frame by two slack wires *B* and *C*. One of these wires *C* is carried to the rack upon which the operator's telephone travels, and which he attaches to his telephone whenever he wishes to learn a subscriber's wants. The other wire *B* is used for the purpose of connecting one subscriber with the other, and Fig. 5 shows the manner in which this is accomplished. The lines entering at different angles are connected by short intermediary wires supported by suitable hangers H^1, H^2 and H^3, and provided with small hooks *o*, for quick coupling. They are then pulled taut by the pulleys *R*, *R*, which are attached to the spiral ring *S* at any point.

It will be evident that the rising spiral prevents any interference between the short connecting wires, as they

are on different levels, so that half a dozen connections may be made at the same time. The perspective, Fig. 1, shows the operator in the act of attaching a subscriber's wire to his telephone. The latter is provided with an arrangement, such that after hooking on to the line a slight tension on a string draws his telephone taut, and he can then speak and hear. After he has made the connection he disconnects his telephone, and is ready for the next call.

The subscribers call the exchange by means of ordinary annunciator drops and magnetos, and they are called in the same way as from the present telephone exchanges. We must also draw attention to the method of connecting various subscribers on one line. This is shown in Fig. 6. The long line running horizontally is run on hangers, one

FIG. 2.—"MECHANICAL TELEPHONE."

of which is shown enlarged at the point where the branch line comes in. The main line runs on continuously, the branch being merely attached to a splice about a foot in length.

The question will naturally be asked, Does this exchange system work, and is the telephone itself a success? In answer to this we must say that so far as our observations have extended, the system is practicable and will no doubt find suitable application. We base this assertion on actual experience with it, the opportunity for which was given to us by the courtesy of Mr. Geo. F. Shaver. The engraving which we give represents the experimental exchange, into which some half a dozen lines enter at different angles, some very acute and nearly parallel.

The lines connecting the subscribers make numerous angles, and the articulation, while not quite as clear as in the Bell telephone, is still good, and distinct enough for all practical purposes. The lines we talked over varied in length from a few hundred feet to nearly half a mile. While good results are already obtained, a number of im-

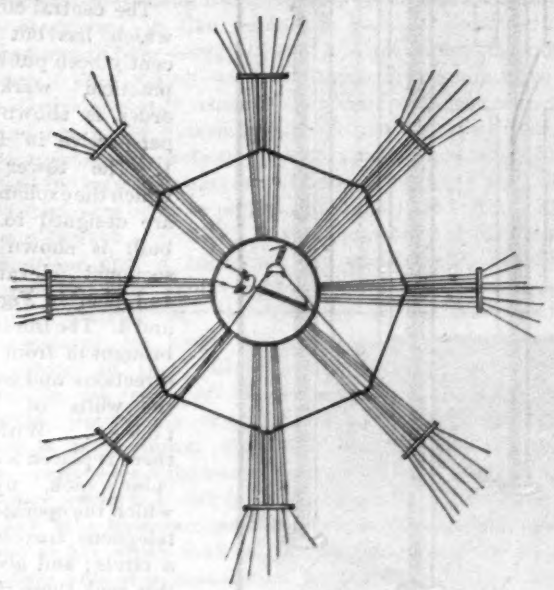


FIG. 4.—PLAN.

provements in the central system are already under way, which will add considerably to its efficiency, it being borne in mind that the one described and illustrated by us is the first experiment in this direction. We know of many places where such an exchange would be most serviceable and profitable.

The Electrical Furnace.

On the first announcement of the discovery of the new electrical furnace by the Messrs. Cowles, of Cleveland, Dr. T. Sterry Hunt went to Cleveland to investigate the subject and in his paper read before the American Inst. of Mining Engineers (which we published in a recent issue) he gave the details of the process. Speaking upon the same subject recently, he said:

"This invention marks a new departure in the application of electricity. Electro-chemical decomposition has long been understood, and now plays an important part in metallurgy. The intense heat of the electric current has also been employed by Siemens for the direct fusion of metals, but the invention of Messrs. Cowles is entirely different in principle. The reducing action of carbon in the form of charcoal or coke by heat is well known to be the basis of the process of obtaining iron and other metals from their oxide. But there are certain metals whose oxides are so refractory that no heat has hitherto been able thus to reduce them, and to obtain these metals indirect and costly chemical processes have been necessary. The Messrs. Cowles, by a process of reasoning based upon an accurate knowledge of both chemistry and electricity, were led to construct a new furnace in which the electric current is made to generate in the presence of charcoal a heat never before attained, and thereby to effect a direct and rapid reduction of these refractory oxides. The chemical results which flow from this remarkable discovery can scarcely now be discussed, except in one or two of their practical applications. Foremost we may notice the rapid and cheap production of aluminum by this process, hitherto obtained only by a very indirect and costly process. The valuable qualities of this metal, which is very light, white in color, and unalterable in the air, are known to chemists, and its alloys with copper and other metals have been found to present such remarkable qualities that despite their great cost they have already found considerable application in the arts. The bronzes produced by adding small quantities of aluminum to copper have the color of gold, do not tarnish in the air, may be cast, rolled, or drawn into wire, and possess a tensile strength even greater than steel. Small quantities of aluminum added to German silver and to brass give alloys equally remarkable in their properties. The application

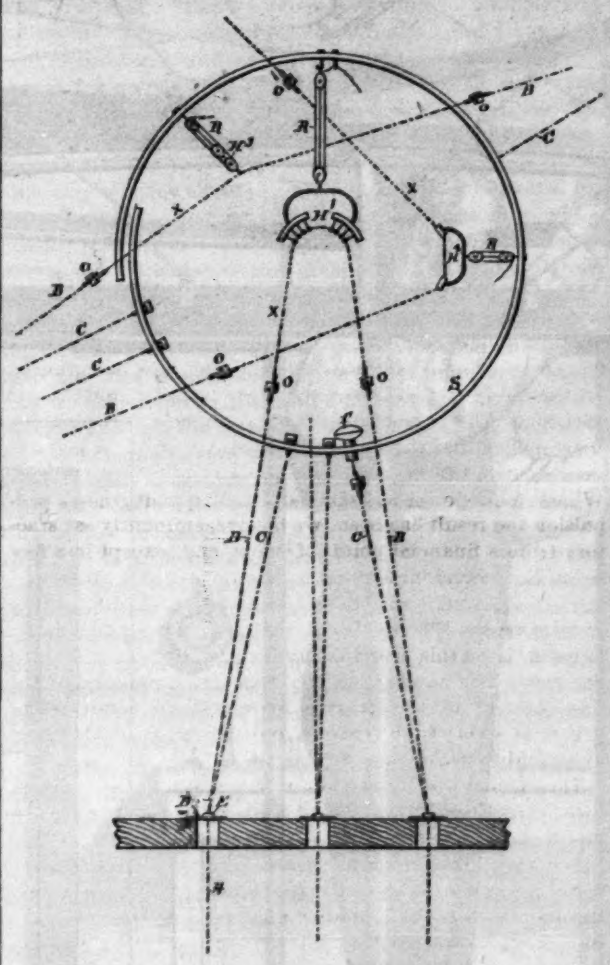


FIG. 5.—DETAILS OF CONNECTIONS.

of all of these in the arts has hitherto only been limited by their great cost. The Messrs. Cowles have already been able to reduce the price of aluminum to one-third its old rate, and with their improved plant will be able to reduce it to one-tenth."

Concluding, Dr. Hunt expressed his confident opinion that this invention is destined to yield results of the highest importance for pure science as well as for the metallurgical art, and will place within the reach of the mechanician and electrician alloys possessing precious and hitherto unattainable qualities.

Two New Forms of Radiophone.

BY E. MERCADIER.

All known radiophones can be divided into two classes:

I. Those in which the transformation of radiant energy into mechanical energy, in the form of sound, is accomplished *directly*. These can be divided into three subclasses, viz.: First, *thermophones*, in which heat rays are brought into action principally; these consist for the most part of gases and vapors inclosed in a transparent envelope. Secondly, *photophones*, employing iodine vapor and peroxide of nitrogen, the vibrations in which are caused throughout by luminous radiations, and finally, *actinophones*, which would be excited by the ultra-violet actinic rays, but of which no example is known as yet.

II. Radiophones which may be called *indirect*, and in which the final transformation of radiant into sonorous energy is effected by one or more intermediate stages. Only one form of the latter is known, the *photophone* of Professor Bell. In this the intermittent radiations act on a layer of selenium, alloys of selenium and tellurium, or lamp-black, placed in circuit with a battery and telephone. In this case, as is well-known, it is the *luminous* radiations principally that act, producing in the circuit variations of electrical energy, whence result the sounds in the telephonic receiver.

These apparatuses constitute in reality indirect photophones, or *photo-electrophones*. I have succeeded in devising two new forms of indirect radiophone based on heat radiations; that is to say, upon the transformation of initial radiant heat energy.

To begin with, I observed that a microphone is sensitive to the action of intermittent radiations. All that is necessary is to take such an instrument, in which the carbons are fixed to a plate or thin diaphragm of polished pine, and connected with a receiving telephone with or without an induction coil in the battery circuit.

By exposing the diaphragm to the action of intense radiations, made intermittent by a perforated revolving screen, the telephone emits a sound the pitch of which varies in a continuous manner with the speed of the disc, the number of vibrations corresponding to those of the interruptions.

In the second place, any telephone transmitter is equally

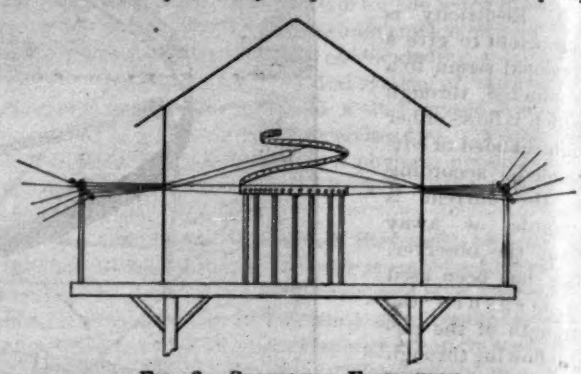


FIG. 3.—SECTIONAL ELEVATION.

sensitive to the same action produced on the iron diaphragm. In the receiver sounds are heard analogous to the preceding.

In both cases the diaphragm of pine or unpolished iron must of necessity vibrate upon the surface absorption of the *thermic* rays, and constitute what I have called a *thermophone*, as I have already shown four years ago. But, in addition, there results from these vibrations a second transformation of energy. In the case of the microphone there are produced, in effect, variations of electrical energy; the sounds heard in the telephone receiver can thus be designated as thermo-electrophonic, and the apparatus itself as a thermo-electrophone. It goes without saying that in using these terms no account is taken of the usual transformations of energy which take place in the telephonic receiver, for they are not employed here as a means of demonstrating the infinitely small vibratory movements. In the case of telephony it is the magnetic energy of the field of the magnet which varies. The sounds of the receiver may therefore be called *thermo-magnetophonic*, and the apparatus so employed constitutes a *thermo-magnetophone*.

The intensity of the effects produced in this way, other things being equal, can be increased in several ways:

1. By lamp-blacking the diaphragms of wood or iron, a means of re-enforcement, which I have already described as applicable to all direct thermophonic effects.

2. By multiplying in some manner the effect of the blackened absorbing surface, by adding a layer of air, which is also put in vibration in a cavity closed by a plate of glass or mica, and placed in front of the diaphragm.

3. By increasing the intensity of the radiating source.

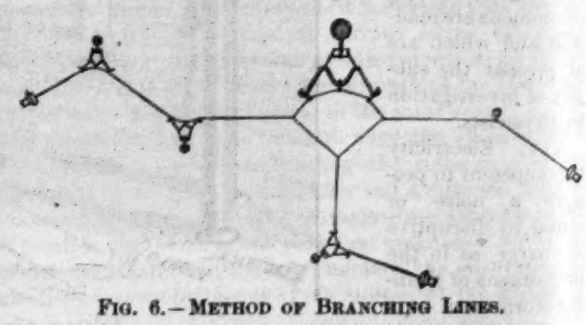


FIG. 6.—METHOD OF BRANCHING LINES.

While the effects are feeble with the oxy-hydrogen light, they are quite marked with the electric light, and still more so with sunlight.

I believe that it will be possible, with an intense solar radiation, to reproduce articulate speech, by employing a method with which I have already succeeded with air or lamp-black thermophones (*Journal de Physique*, t. x., 1881); but I am obliged to await a more favorable time.

Thus two direct thermophonic and the indirect thermo-magnetophonic effects can be observed in a simple apparatus. Take any kind of telephone with blackened diaphram and cover it with a cylinder so as to constitute an air chamber closed by a glass plate, the cylinder having a lateral opening in front of the diaphragm, to which an acoustic tube is attached. A second tube is fitted to an opening in the side of the telephone behind the diaphragm; finally the ends of the helix in the telephone are connected to the receiving telephone. Applying the ear to the two tubes and to the receiver, there is heard: In the first tube, the thermophonic sounds of the air in front of the diaphragm; in the second tube, the thermophonic sounds

of the air within the instrument; and in the receiver the thermo-magnetophonic sounds. As might be expected the latter sounds, being the result of several transformations of energy, are not so intense as the two others.

Is the Western Union Ready to Sell Out?

An "interview" with Cyrus W. Field, published in his own paper, the *Mail and Express*, makes him say:

"I am clearly of the opinion that the time has arrived when the United States Government should purchase all the telegraph lines in the country. It would be a great convenience to the public if every telegraph office was a post-office and every post-office a telegraph office. A law should be passed by Congress making all the purchases, so that every company should be bound by a principle. Each telegraph company should select an arbitrator and the Government choose another. If these two disagreed, they ought to choose a third, who should be a man thoroughly experienced and regarded as an expert in the business. These arbitrators should have power to examine all reports and accounts, so as to arrive at the fact as to the actual net profits the line or lines had earned during the year 1885. The Government should then establish as a principle that the stock of the company which had earned 5 per cent. clear profit, over and above every expense, must be rated at par in making the purchase.

"By the issue of 3 per cent. bonds the Government will be enabled to reap the profit on the investment as between 3 and 5 per cent. and also gain on the results of the constantly increasing business and by the great saving in rent of offices. Under this principle the United States Government would, in much less than fifty years, own all the telegraph lines in the country, and actually without cost to the Government or people. This principle was adopted by the English Government and was found to be just to all."

"Why do not all telegraph companies succeed?"

"There is not business enough for all of them to live upon. They will be fighting for business and rates will be cut, so as not to pay operating expenses. This is of no benefit to the people at large, and the companies are unable to maintain themselves during the conduct of the useless warfare."

Operators "Smarter" than Bookmakers.

Exceeding great grief pervaded the ranks of the bookmakers on Sunday last. A pall of gloom settled over the countenances of those who on Saturday sold pools on the New Orleans races, and some there were who declared

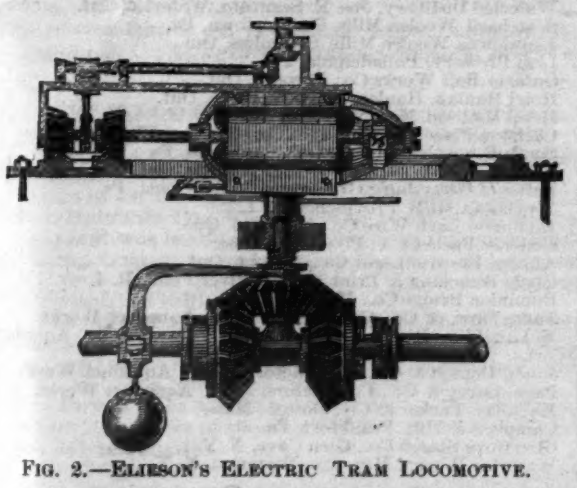


FIG. 2.—ELIESON'S ELECTRIC TRAM LOCOMOTIVE.

that their confidence in human nature had been cruelly betrayed. The claim was set up that a party of telegraph operators, whose integrity and honesty had never been doubted, had suddenly turned wolf and eaten up the profits of many hard days' work. The story, as told by a buyer of pasteboard tickets, illustrates the ease with which the bookmakers are sometimes sheared:

"There was nothing unusually crooked in the New Orleans races, as far as I can see," said the buyer of pools. "The first and second races went off all right, and when it came to the third the money was placed this way:

"'Bob Swim, even money; Fletch Taylor, eight to five; Fleur de Lis, three to one; John Sullivan, five to one; Judge Jackson, thirty to one'

"Now, any man in his senses," continued the buyer, "wouldn't have taken much stock in Judge Jackson, even at 30 to 1, because nobody expected him to win. Well, along about the time that the post of the third race should have come in by special wire, about 12 or 15 young men bounced into most of the New York pool rooms and laid all the way from $10 to $30 on Judge Jackson. About 15 minutes after the post—that's the finish, you know—should have been received, along came word that Judge Jackson had come in ahead. Crosby & Co., of No. 10 Chambers street, tumbled to the game in a minute, and they thumped one of the fellows who had money on Judge Jackson, and thumped him well. They didn't lose anything, but the rest of the bookmakers about town—40 of them all told—lost from $6,000 to $8,000. Goodwin & Hughes, of No. 48 Chatham street, and Walbaum & Co., of No. 43 Chatham street, lost heavily. They all saw that it was a skin game, and all said that the finish had been held back by telegraph operators until the pools on Judge Jackson could be laid."

The claim of the pool-sellers is that the pools on Judge Jackson were laid after the race was finished. They believe that some telegraph operators at Cincinnati, after receiving the result of the race, broke the main wires and sent the news to their confederates in New York, who laid the pools. When the pools were laid, it is alleged, the main wires were opened and the post forwarded in the usual way.

Elieson's Electric Tram Locomotive.

Almost every available source of power has at one time or another been, experimentally at least, pressed into the tramcar service. The object in view has been, of course, the substitution of mechanical for horse propulsion. The latter means of locomotion, except for ordinary work, is

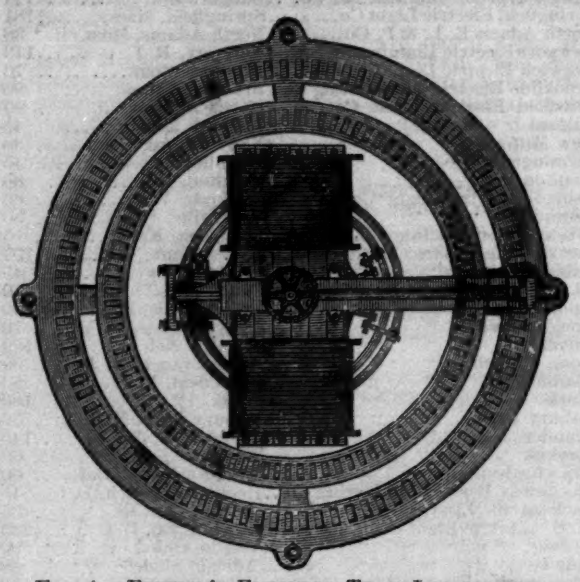


FIG. 1.—ELIESON'S ELECTRIC TRAM LOCOMOTIVE.

far from economical; the cost of the fuel employed to produce the motive power, namely, oats and hay, being high, whilst the rate of depreciation through wear and tear is excessive. The balance sheets of the horse-car companies show indeed that the amount which has to be wiped off each year on this account is something almost alarming. Where steam power has succeeded in displacing horse propulsion the result has been, we believe, eminently satisfactory from a financial point of view, and, except in a few cases, the abandonment of horses is probably merely a matter of time. Mr. Elieson's system, which is being worked by the Electric Loco motive and Power Company, London, is on this principle, and is undoubtedly a promising one. The novelty in the apparatus consists in the arrangement of the gearing by which the motor can be driven at a very high velocity, and thus work under favorable conditions for economy.

The mechanical connection of the motor is very ingenious. Mr. Elieson has applied a lever between the electro-motor and the axle of the locomotive in such a way that the motor, which must necessarily run at a high rate of speed in order to develop the greatest efficiency, acts through the lever by a method analogous to the case of a man using a crowbar for the purpose of lifting a heavy weight. By this contrivance the *vis inertia* of the loaded tramcar is easily overcome, and it is evident, even to non-scientific readers, that speed is then easily attained until the natural speed of the electro-motor is approached by the rate of speed of the driving wheels.

Instead of the electro-motor being a fixture, and having motion transmitted from it through belt or crank gearing to the wheels of the car—a method which involves loss of power and necessitates the provision of ample space—the motor itself revolves, the motion being transmitted through bevel gearing. It has, as will be seen by our illustrations, Figs. 1 and 2, a vertical shaft through its centre, to which a motion lever projecting horizontally about 2 feet, and carrying at its outer end a spur-wheel gearing into a fixed circular rack, is secured. This vertical shaft carries at its lower end a bevel wheel, which gears into one or other of two similar wheels on the driving axle of the engine. The mitre gearing is equipped with a mechanical clutch, by means of which the engine may be made to run either backward or forward; a lever, acting mechanically, throwing the motor in or out of gear, or adjusting the clutch by a simple movement of the hand. This suggests itself to us as being a very good arrangement indeed. In the first place there is a minimum loss of energy, in that the motion being applied direct to the axle there is very little energy wasted in friction, etc.; in the second place the motor, always traveling in the same direction, and being above the floor level of the car, it is subject to fewer strains and fewer losses than is the case when reversals are made and when the motor is placed below the floor level, and therefore during wet weather in nearer proximity to a source of leakage; and, in the third place, there is due to the lever a decided gain of power at the moment when it is most wanted, *i. e.*, at starting. The electrical details are very simple. The motor is fitted with collecting brushes traveling on two fixed circular rings of copper, separated from each other by a flange. The speed of the motor is varied by inserting resistances in the ordinary way, and it is evident that great care has been exercised to avoid anything like complexity. The locomotive (Fig. 3) in appearance resembles a small car, and weighs 4 tons 17 cwt. The motor, which is of four horse-power, consumes about forty ampères per hour, so that it carries power sufficient for six or seven hours of motion, and makes about 600 revolutions per minute when in full swing, or a maximum of 1,000 on a level road. The speed obtained is eight miles per hour, it being for certain obvious reasons not desirable to exceed this rate. Fifty E. P. S. storage cells are used, giving 280 ampère hours.

Mr. E. H. Goff and the Canadian Agricultural Insurance Company.

Considerable surprise was caused in electrical circles last Friday, the 18th, by the appearance in the newspapers of an Associated Press dispatch from Montreal, to the effect that the creditors of the Canadian Agricultural Insurance Company had dispatched lawyers to New York to secure the extradition of Mr. E. H. Goff, the well-known President of the American Electric Manufacturing Company. The statement in the dispatch was as follows:

"In 1878 the assignees of the company began criminal proceedings against Goff, and the grand jury returned true bills against him for various offenses, but he fled from the country and has remained out of it ever since, residing in various parts of the United States. According to the records of the Criminal Court, there are at present eight true bills against him, namely, for forgery, for uttering forged instruments—both of which are extraditable offenses—for making false returns, for libel, and for appropriating property of the company.

"It is hinted that his former associates, who are also his business rivals, learned something of the circumstances under which he left Montreal, and sent an agent here to persuade some of the shareholders of the Canada Agricultural Insurance Company to try to have him extradited."

Since then Mr. Goff has been interviewed by several newspapers at his offices up town.

Mr. Goff said that he was not in the least disturbed, and was going about his affairs as usual. He had known for some time of the plans which were being laid, and which had culminated in the publication of the dispatch referred

FIG. 3.—ELIESON'S ELECTRIC TRAM LOCOMOTIVE.

to. He was and had been aware of the presence in New York for some days of several parties interested, as they claimed, in his extradition, but really interested in procuring money from him by threats of prosecution. He was, of course, acting under the advice of counsel, and regretted that they had enjoined him from stating for publication his side of the story in detail. Under the circumstances he felt at liberty to say merely that the charges against him in Montreal were not only absolutely false, but were eight years old, and were the outgrowth of a bitter political controversy, in which he had been instrumental in disgracing certain corrupt officials. The charges are now revived, at the instigation of certain rivals in business, jealous of the success of his enterprises. He had not been living in "various" parts of the United States, as the dispatch alleged, but in Boston since 1878 in business which had brought him prominently before the public, and since 1884 had divided his time between Boston and New York. He deprecated "trial by newspapers," but would be found to be ready at the proper time and before the proper tribunals to take prompt and vigorous measures not only to protect himself, but to punish those who seek to injure him for their own advantage.

Mr. F. Montague Sowdon, in a letter to the Boston *Globe*, of Dec. 21, treats the charges as worthy only of ridicule and contempt. He says: "Inasmuch as I acted in the capacity of auditor of the said Canada Agricultural Insurance Company during almost its entire existence, I am in a position to state most emphatically that the several charges made are *false in every particular*. And inasmuch as numerous overtures have been made to Mr. Goff, to my certain knowledge, to settle all charges against him

for amounts varying from $5,000 to $7,500, the public can judge of the intent of the present alleged proceedings.

"Mr. Goff has always claimed, and does now, that he is not, and never was, indebted to the insurance company, but on the contrary, that the company rightfully owes him a considerable amount of money." Mr. Sowdon attributes the revival of the charges to political animosities, and closes his long communication thus, after analyzing the statements: "The influence of this old political feud has been at work against Mr. Goff here, ever since, notwithstanding which he has made some little progress in business, as you know, and I think it is about time this whole matter is correctly understood by the public and the different business interests here and in New York which are secretly allied against him, as will be shown in due time, were unmasked and exposed. The present move, I have good reasons for thinking, emanates from some electrical interests here and in New York, with a view to injure Mr. Goff in his present business enterprise in New York, and not with any desire to have him prosecuted for alleged offences committed in Canada eight or nine years ago."

Electric Light Wires, Submarine and Underground.

The Western Edison Light Company, whose headquarters are in Chicago, have during the past summer, in accordance with their contract with their city authorities, arranged to light the city building and tunnels under the Chicago river.

The entire service is worked underground through conductors insulated with kerite furnished by Mr. A. G. Day, of New York. These conductors are of capacities ranging from one ton of copper to the mile, down to 65 lbs. of copper to the mile. The service has been tested by the city electrican and the insulation found to be largely in excess of requirements.

At Two Rivers, Wis., the same company have put in a plant and have placed an armored submarine lead through the river. This was also furnished by Mr. Day, and is one of the many successful submarine leads with kerite insulation. As an insulating medium for underground and submarine use kerite has proved successful, submarine leads being in use for the past five years at Scranton, Miss., at Baltimore, at St. Catherines, Ontario, under the Welland Canal, and at various other points, and underground in almost all the large cities. The Chicago plant of the Western Edison is a striking feature, even in that city, where underground service has ceased to be a novelty.

A Cheap and Effective Electric Scarf Pin.

The small incandescent lamp mounted upon a scarf pin and fed by a battery carried in the pocket still excites the wonder and admiration of thousands, and we ourselves have heard many ludicrous expressions called forth by it when flashed suddenly in the dark. For some time the Union Electric Company, of No. 1 Ann street, this city, has been making such a small lamp outfit, consisting of a small hard rubber cell and lamp. The filament of the latter consists of a very fine platino-iridium wire which resists well the high incandescence to which it is brought. The battery is of very small compass, so that it can be carried in the vest pocket. Perhaps the most inviting part of the whole arrangement is its low cost, which amounts to but $2, including everything. The company ought to find many patrons for this cheap and effective outfit.

Electric Light and Power with Batteries.

Mr. James H. Howard, of the Chemical Electric Light and Power Company, controlling the Kauffer battery system, communicates the subjoined particulars:

One main idea of ours is manufacturing and selling battery solutions which shall always be maintained at a uniform and standard strength is in itself novel, and one which the public will not be long in appreciating. The announcement of a *new* and wonderfully efficient battery solution such as our new "volta pavia" patented has proved itself to be is still more interesting to all users of primary batteries, and we predict that its very general use as a substitute for bichromate of potash is only a question of time, as it not only does *five times* the work, but of course saves the trouble and expense of renewing the solution three times, to say nothing of the saving of fully one half the solution which is usually thrown away as worthless, when the battery is *cleaned up* (the zincs and carbons cleaned), as is necessary in all bichromate of potash batteries.

Volta pavia is a patented solution, but it is to be sold as a universal depolarizer to all users of batteries. It is claimed for it that is is cheaper, etc., etc. (see circular), and it is certainly worth the while of all electricians and batterymen to give its claims a fair investigation and trial.

The Chemical Electric Light and Power Company, who own the patents and control the use of volta pavia in batteries, have also devised and patented an improved form of cell, especially adapted to the best use of volta pavia for incandescent lighting.

By New Year's day the elevators in the New York Mutual Life Insurance Co.'s building, Post Office square, Boston, probably the finest elevators in the city, will be lighted by their new batteries, where all having business with the company can see them.

The Advance of Electric Lighting in 1885.

We give below figures from several of the electric lighting companies showing what they have done during the past year. Great trouble has been taken to make the returns complete, but, striking as the totals are, they do not present a full view of the new electric lighting business done in 1885, as a few of the companies, and those not the smallest, have been too busy up to the present time to report. In connection with these figures, should be read the able and interesting review of the progress West, by our Western manager:

THOMSON-HOUSTON COMPANY.

The following shows companies organized, new plants installed and increase in lamps since Jan. 1, 1885, by the Thomson-Houston Electric Company:

New local companies.	Location.	No. of lights.
Bangor Electric Illuminating Co.	Bangor, Me.	114
Springfield Electric Light Co.	Springfield, Mass.	181
North Adams E. L. & P. Co.	North Adams, Mass.	38
Newport Electric Illuminating Co.	Newport, R. I.	113
Norwich Electric Light Co.	Norwich, Conn.	76
Brookline Electric Illuminating Co.	Brookline, Mass.	90
Pittsfield Electric Light Co.	Pittsfield, Mass.	90
Milford " " "	Milford, Mass.	45
New Milford " " "	New-Milford, Conn.	38
Birmingham " " "	Birmingham, Conn.	45
Houlton " " "	Houlton, Me.	60
Oshkosh Electric Light Co.	Oshkosh, Wis.	60
Janesville " "	Janesville, "	50
Western Construction Co.	Atchison, Kan.	75
Terre Haute Electric Light Co.	Terre Haute, Ind.	105
Atlanta " " "	Atlanta, Ga.	45
El. Light and Power Co. of Mobile.	Mobile, Ala.	60
Jacksonville Electric Light Co.	Jacksonville, Fla.	60
Poughkeepsie " " "	Poughkeepsie, N. Y.	79
Omaha " " "	Omaha, Neb.	180
Long Branch " " "	Long Branch, N. J.	90
Plainfield " " "	Plainfield, N. J.	50
York " " "	York, Pa.	180
Asbury Park " " "	Asbury Park, N. J.	50
Camden " " "	Camden, N. J.	145
Keckuk " " "	Keokuk, Iowa.	60
Crawfordsville " " "	Crawfordsville, Ind.	60
Rockaway Beach Illuminating Co.	Rockaway Beach, L. I.	45
Jacksonville Electric Light Co.	Jacksonville, Ill.	36
U. S. Electric Light Company	Washington, D. C.	225
Toledo " " "	Toledo, Ohio	90
Adrian " " "	Adrian, Mich.	60
Bloomington Electric Light Co.	Bloomington, Ill.	150
Thomson-Houston Electric Co.	Danville, Va.	60
Lake Electric Light Co.	Lake, Ill.	100
Richmond Electric Light Co.	Richmond, Ind.	38
Thomson-Houston Electric Light Co.	Raleigh, N. C.	55
Birmingham Electric Light Co.	Birmingham, Ala.	60
Freeport Gas Light and Coke Co.	Freeport, Ill.	60
Oakland " " "	Oakland, Cal.	75
Ashland Gas Light Co.	Ashland, Pa.	25
New Foreign Companies:		
Lima	Peru, South America	100
Callao (in process of construction).	" " "	—
Para " " "	Brazil, " "	—
Guayaquil	Equador, " "	50
Guatemala Electric Light Co.	Guatemala, Central Am.	300
Milan	Italy	34
Palermo	"	10
Leeds	England	12
Hernosand	Sweden	45
St. John's	Newfoundland	90
Increase of lamps, Jan. 1, 1885, to Dec. 15, 1885:		
Consolidated Electric Light Co.	Portland, Me.	85
" " " "	Old Orchard, Me.	
Lewiston & Auburn Electric Lt. Co.	Lewiston, Me.	45
Merchants' E. L. & P. Co.	Boston, Mass.	92
Lynn Electric Lighting Co.	Lynn, Mass.	28
Salem " " "	Salem, Mass.	40
Worcester Electric Lighting Co.	Worcester, Mass.	90
Middlesex " " "	Lowell, Mass.	50
Wachusett " " "	Fitchburg, Mass.	19
Fall River Electric Light Co.	Fall River, Mass.	31
Narragansett " " "	Providence, R. I.	295
Pawtucket " " "	Pawtucket, R. I.	45
Hartford " " "	Hartford, Conn.	188
New Haven " " "	New Haven, Conn.	180
Bridgeport " " "	Bridgeport, Conn.	95
Conn. District T. & T. Co.	Waterbury, Conn.	45
Syracuse Electric Light & Power Co.	Syracuse, N. Y.	100
Auburn Electric Light Co.	Auburn, N. Y.	28
Citizens Electric Illuminating Co.	Brooklyn, N. Y.	358
Elmira Electric Light Co.	Elmira, N. Y.	57
Municipal Electric Light Co.	Brooklyn, N. Y.	210
Bethlehem " " "	Bethlehem, Pa.	76
Champion " " "	Springfield, Ohio	90
Columbus " " "	Columbus, "	50
Citizens " " "	Akron, "	30
Cleveland " " "	Cleveland, "	240
Gem City " " "	Quincy, Ill.	27
East St. Louis Electric Light Co.	E. St. Louis, Ill.	35
Citizens " " "	Des Moines, Iowa.	90
St. Louis Thomson-Houston E. L. Co.	St. Louis, Mo.	135
St. Joseph Electric Light Co.	St. Joseph, Mo.	25
Kansas City " " "	Kansas City, Mo.	128

THE EDISON COMPANY.

In a late number we gave some information regarding the Edison business. A portion of the remarks may now be quoted:

"A few numbers ago we quoted some of the statistics of the growth of the Edison Company's business. An analysis of the last figures compiled shows in an even more striking manner the rapid advance of the Edison system in popular favor. The figures are given in the minutest detail, so that one can see at a glance the location of the plant, its size and its function. Making a summary of the various tables, we find that of isolated Edison plants in the country at the present hour, owned and operated by the purchasers themselves, there are no fewer than 520, with 132,875 lamps.

"In the 'American Electrical Directory' for October, 1884—a publication whose statements may be taken as approximately correct—there appeared a list of isolated plants, showing a total of 451 plants and 97,424 lamps, of which 358 plants and 78,432 lamps were of the Edison system. The company has, however, as above shown, increased its output to 520 plants and 132,875 lamps up to October 1, or an increase, taking this basis, of 41 *per cent.* on plants and 69 *per cent.* on lamps."

"Village plant" stations established in 1883 and 1884, aggregated 29,200 lamps. The V. P. stations established in 1885 aggregate 24,150 lamps, so during the last year nearly as much business has been done as in the two previous years.

VAN DEPOELE COMPANY.

The following are the figures of the Van Depoele Electric Manufacturing Company:

ARC LIGHTS.

Flint, Mich., 40 lights.
Jackson, Mich., 60 lights.
Detroit, Mich., 10 lights.
Detroit, Mich., 6 lights.
Ishpeming, Mich., 2 lights.
Little Rock, Ark., 10 lights.
Fort Smith, Ark., 60 lights.
Pine Bluff, Ark., 60 lights.
Fort Worth, Tex., 80 lights.
Winona, Minn., 40 lights.
Sioux Falls, Dak., 30 lights.
Chicago Museum, 10 lights.
Buffalo Electric Works, Buf., N. Y., 10 lights.
Cheltenham Beach, Chicago, 40 lights.
M. C. Boas, Chicago, 10 lights.
Mason & Davis, Grand Crossing, Ill., 12 lights.
Capital City Gas Light Company.
Des Moines, Iowa, 70 lights.
Louisville Hotel, Louisville, Ky., 6 lights.
J. Beifield, Chicago, 5 lights.
Princess Rink, Plainfield, N. J., 20 lights.
Joliet, Ill., 8 lights.
Princess Rink, Cincinnati, O., 12 lights.
Lake Side Rink, Chicago, 8 lights.
Walter Scott & Co., Plainfield, N. J., 20 lights.
L. Schrieber's Sons, Cincinnati, 8 lights.
Carson, Pirie, Scott & Co., Chicago, 40 lights.
Adams Manufacturing Co., Erie, Pa., 16 lights.
Kearney, Neb., 40 lights.
Blue Island Av. E. L. Co., Chicago, 40 lights.

INCANDESCENT LIGHTS.

Northwestern Lead & Oil Co., Chicago, 50 lights.
Wm. Deering & Co., Chicago, 200 lights.
Commercial Gazette Building, Cincinnati, 300 lights.
I. Walker Brewing Co., Cincinnati, 20 lights.
J. W. Burdette, Burlington, Ia., 20 lights.
Detroit, Mich., 50 lights.

Several installations for the distribution of power, and electric railways have also been made by the company, all of which are working successfully at the present time.

THE BALL COMPANY.

The majority of the following-named concerns and individuals commenced using the Ball system of electric lighting since January 1, 1885, viz.:

Hanlan's Point Ferry Co., Toronto, Ont.
Jersey City E. L. Co., Jersey City, N. J.
Grimsby Camp Ground Co., Grimsby, Ont.
Scranton E. L. and Heater Co., Scranton, Pa.
Moss Park Skating and Curling Rink Co., Toronto, Ont.
Ingersoll Rock Drill Co., New York City.
Goldie & McCullough, Galt, Ont.
Clark Insulated Wire Co., Bristol, Pa.
Bruntford E. L. Co., Bruntford, Ont.
McIlvain & Sons' Boiler Plate Works, Reading, Pa.
Waterford Electric Light Co., Waterford, Ont.
Centennial Brewery, Philadelphia, Pa.
John Doty Engine Co., Toronto, Ont.
National Worsted Mills, Providence, R. I.
Dominion Bridge Co., Toronto, Ont.
Waterloo Distillery, Jos. E. Seagram, Waterloo, Ont.
Scatchard Woolen Mills, Germantown, Pa.
Lansdowne Woolen Mills, Columbus, Ont.
Lion Brewery, Philadelphia, Pa.
Ontario Bolt Works Co., Toronto, Ont.
Hotel Hanlan, Hanlan Island, Toronto, Ont.
Hotel Madison, New York City.
Carleton Place Electric Light Co., Carleton Place, Ont.
South Pennsylvania Railroad, Ray's Hill, Pa.
Port Hope Electric Light Co., Port Hope, Ont.
Battle of Gettysburg Cyclorama, Philadelphia, Pa.
Weybosset Mills, Providence, R. I.
Dominion Barb Wire Co., Montreal, Que.
Godfrey Packet Co., Plymouth, Mass.
Almont Electric Light Co., Almont, Ont.
Clyde Bleaching & Print Works, River Point, R. I.
Dominion Bridge Co., Montreal, Que.
Smith Bros. & Co., Contractors, N. Y. Aqueduct Works.
McLaughlin, Rielly & Co., Contractors, N. Y. Aqueduct Works.
Jones, Denton & Co., Contractors, N. Y. Aqueduct Works.
Page, Carey & Co., Contractors, N. Y. Aqueduct Works.
Macullar, Parker & Co., Boston, Mass.
Campbell & Hill, Frankfort, Pa.
Glen Cove Starch Co., Glen Cove, N. Y.
Waterloo Woolen Mfg. Co., Waterloo, N. Y.

THE AMERICAN COMPANY.

This company, it will be remembered, had until recently installed only Thomson-Houston plants. It has now obtained sole control of the Fuller-Wood system, and during the last few months has been busily engaged making preparations to fill orders for new installations during 1886.

THE EXCELSIOR COMPANY.

This company have continued during the past year to do a steady, solid business. They have not been able to get the figures ready in detail, but we find that since the beginning of the present year they have installed 1,719 arc lamps and 3,100 incandescent. At the present time they are about to put in various new plants.

THE SCHUYLER COMPANY.

This company, under its new and energetic management, has made strong running in the latter half of the year. It has installed the following plants during the six months: New Britain, Middletown and Danbury, Conn., city contracts in each case, with a large number of private subscribers: Columbia, Allentown, Pottsville, Pa.; Skowhegan, Me.; Chicago, Ill.; Knoxville, Tenn.; Richmond, Va.; Elizabeth, N. J.; Holyoke and Marlboro, Mass.; aggregating some 2,000 lights.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Dec. 19, 1885.

There was recorded at the office of the Secretary of State last week, notice of intention to file a petition to the General Court for incorporation as an elevated railway company by several petitioners, among whom are John W. Candler, Frederick O. Prince, M. D. Ross and Bainbridge Wadleigh. The petitioners desire to be incorporated as the Boston Elevated Railroad Company. Their project is to

build and operate elevated railroads on which trains shall be run by electricity. One proposed line is from Scollay square to Harvard square, Cambridge; others from the same or another central point to West Roxbury Park, and to Brookline town hall, and from the foot of Summer street to Milton town hall. Besides these a circuit railroad is proposed, to extend from the Boston & Lowell Railroad, along the shore front, to the New York & New England Railroad, thence, via the Old Colony, Albany, and Providence railroad stations, to the Lowell, completing the circuit. The projectors claim to have certain advantages over any previously devised plan, in the particulars, especially, of operating by electricity and not by steam, and in the model or design of their road and its running gear. The construction requires but a single line of posts. From post to post a single main rail is extended, which takes the weight of the train. Parallel on each side is another rail of lighter construction. These two outer rails are also attached to the post, and are available as safety or guide rails. The cars will be of the width usual for elevated railroads. The absence of steam is deemed an advantage, as there will be less liability of frightening horses. It is the intention to begin at once with a model track of a half-mile length in order to demonstrate the feasibility of the proposed plan.

The telpherage system of automatic aërial transportation by electricity is being laid before the Spencer manufacturers with the view of laying a line between the factories and South Spencer, where the main line of the Boston & Albany Railroad is met.

The following electric lighting companies and plants are using boilers set with the Jarvis patent furnace for burning screenings for fuel, viz.:

Edison System.—Edison Electric Light Company, Roselle, N. J.; Edison Electric Light Company, Menlo Park, N. J.; Edison Electric Light Company, Harrisburg, Pa.; Edison Electric Light Company, Brockton, Mass.; Edison Electric Light Company, Lawrence, Mass.; Edison Electric Light Company, York, Pa.; Edison Electric Light Company, New Bedford, Mass.

Brush-Swan System.—Brush Electric Light Company, Boston, Mass.; Brush Electric Light Company, Baltimore, Md.; Brush Electric Light Company, Albany, N. Y.; Brush-Swan Electric Light Company, Norfolk, Va.; Brush-Swan Electric Light Company, Milford, Mass.; Brush-Swan Electric Light Company, Binghamton, N. Y.

Thomson-Houston System.—Merchants' Electric Light Company, Boston, Mass.; Narragansett Electric Light Company, Providence, R. I.; Woonsocket Electric Light Company, Woonsocket, R. I.; New Haven Electric Light Company, New Haven; Consolidated Electric Light Company, Portland, Me.; Lewiston Electric Light Company, Lewiston, Me.; New Bedford Electric Light Company, New Bedford, Mass.; Bridgeport Electric Light Company, Bridgeport, Ct.; Bar Harbor Electric Light Company, Bar Harbor, Mass.; Bangor Electric Light Company, Bangor, Me.; Norwich Electric Light Company, Norwich, Ct.; Newport Illuminating Company, Newport, R. I.; Waterbury Electric Light Company, Waterbury, Ct.; American Electric Light Company, Martha's Vineyard, Mass.; St. John Electric Light Company, St. John, N. B.; Union Electric Light Company, East Boston; Brookline Electric Light Company, Brookline, Mass.; Royal Electric Light Company, Montreal, Canada; Newfoundland Electric Company, St. Johns, N. F.

Weston System.—U. S. Electric Light Company, Washington, D. C.; U. S. Electric Light Company, New York.

W. I. B.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Dec. 21, 1885.

The Edison Company for isolated lighting has been given the contract for installing an incandescent plant of 400 lamps in the new building of the Massachusetts Mutual Life Insurance Co., Nos. 46–8 State street. The wiring for the plant was begun some time ago by the New England Wiring Company; and as far as the work has progressed, it is pronounced a combination of artistic workmanship and electrical skill.

The price of gold and stock tickers to Boston subscribers other than members of the Stock Exchange has been changed to the following: For a local ticker, per month, $18; and for a New York ticker, $15; or for both, $30. The former price was $6 per week for the New York ticker alone. Members of the Stock Exchange get both tickers for $25 per month.

The Tropical American Telephone Company's directors have declared a dividend (the third semi-annual) of 1 per cent., or ten cents per share, payable Jan. 15, 1886, to stockholders of record Jan. 1, 1886.

The quick assets of the company amount to about $20,000 in excess of all debts, assuring dividends for two years more, even if no business was done. This makes 10 per cent. income on $2 per share, or 8 per cent. on $2.50, which latter is nearer the real value of the stock at present.

The Metropolitan Police Commissioners of Boston recently returned home after visiting Chicago, St. Louis and other western cities and towns, where the various police signal systems are in use. The object of their visit to the cities and towns named was to inspect and examine the systems aforesaid, with a view of adopting the one most practical and reliable in its working.

Within a fortnight after their return to Boston, the commissioners ordered the police signaling apparatus of the Municipal Signal Company, of this city. This system is the invention of Mr. Jno. C. Wilson, the well-known electrician.

At the central offices of the New England Telephone and Telegraph Company, corner Pearl and Franklin streets, business is reported as never having been better than at present. The company has just ordered one of the latest and most highly improved styles of multiple switch-boards from the Western Electric Company, having a capacity of 1,100 lines. It was found necessary to have an apparatus of this kind to accommodate the large and steadily increasing business of the company's new exchange on Tremont street, which, by the way, is now the centre for all the Back Bay subscribers.

The Fitchburg Steam Engine Company, of Fitchburg, Mass., are the manufacturers of one of the most reliable, durable and economical engines in the market, and which is especially adapted for electric lighting purposes. The popularity of the engines made by this company is attested to by the outspoken praise of several electric light companies who have had the engine in constant use for upward of two years.

At the offices of the Baltimore & Ohio Telegraph Company, in this city, the facilities for transacting business are constantly being taxed to the utmost. The system is daily becoming more popular, and its increasing business demands an enlargement of its premises, and an increase of operators.

On the first of January, the company will have its branch in the post-office building in readiness for business.

Quite a number of people have recently purchased from Messrs. Milliken & Co., of this city, outfits of the Reis telephone, for experimental purposes. The apparatus is gotten up in the neatest shape imaginable, and for usefulness and as an ornament it is well worth every cent. asked by the manufacturers.

W. I. B.

PROVIDENCE, Dec. 15.

The "Mogul" light is having quite a run in Providence. B. H Gladding & Co., H. W. Ladd & Co., and other prominent houses have installed it with gratifying results. The manager of Infantry Hall has also been made happy by the Rhode Island Electric Lighting Co., who have contracted for the lighting of the hall, and have succeeded in making it the best lighted and the best ventilated hall in the city.

The Rhode Island company have recently put an isolated Mogul plant in the Granger Foundry and Machine Company, and have contracted for a fifty-light "Mogul" plant for the Silver Spring bleachery; while at their station, finding their power inadequate to the demand for lights, they have contracted for two steel boilers of one hundred horse-power each.

The Narragansett Electric Light Company have completed their alterations and have recently added the fifty street lights called for by the city contract. We understand the recent increase in their plant, to have been made up of the divided arc lights, using 6.2 ampère currents; their full lights demand 9.6 ampères.

This company have recently lighted the Boston store, and have added largely to the number of commercial lights.

The Corliss Steam Engine Company are remodeling their works, and are expected to make several innovations in engines for electric lighting.

Two electrical patents issued to Providence parties have attracted considerable attention; one to Mr. R. A. Bailey, of the Corliss Steam Engine Company, for an electro-magnetic cut-off, for which great sensitiveness and close regulation is claimed. The other, issued to Stephen Nicholson, of the Nicholson File Company, in conjunction with a Mr. Bowen, consists of a process of carbonizing incandescent filaments while hermetically sealed under melted lead, thus completely preserving the filaments from oxidation during the baking. The carbon is said to be very tough and elastic and of a remarkable uniformity of resistance.

PROVIDENCE, Dec. 22, 1885.

The Providence office of the Boston Electric Company is at the magnificent store of Messrs. Kinnicutt & Brown, Nos. 176 and 178 Westminster street; Mr. E. C. Perkins, agent. The firm mentioned are special agents for Messrs. Mitchell, Vance & Co., of New York, and persons in New England desiring electroliers can get them from this firm on equally as good terms (and with the saving of delay) as from the manufacturers.

The R. I. Telephone and Electric Company are now receiving their new jars for their Little Giant battery, and are prepared to furnish the trade in small or large quantities, at a moment's notice. The new jar possesses many valuable points, and thereby increases the merits of the popular battery above named.

Mr. H. W. Kilburne, formerly manager of the Baltimore & Ohio district messenger service in Boston, has been placed in charge of the system in this city.

The Brown & Sharpe Manufacturing Company are finding an unprecedentedly large sale this season for their universal lathe, especially among manufacturing electricians. The superiority and excellence of the goods made by this well-known company is an established fact.

The Armington & Sims Engine Company are busy day and night filling orders for abroad as well as at home. Every season finds this enterprising company enlarging their facilities for manufacture to enable them to keep apace with their steadily increasing patronage. New and important improvements are being made from time to time in their popular engines.

W. I. B.

PHILADELPHIA NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
PHILADELPHIA, Dec. 20, 1885.

The neighborhood of Tenth and Chestnut streets, once the busy headquarters of the Western Union, is now practically deserted; the lively centre of local telegraphy has been removed to Broad and Market streets. Tenth street is being cleared of its labyrinth of wires, and the linemen are taking down and carting off the immense poles, some of them 130 feet in height. The auditorium of the old Tabernacle Church affords a splendid operating room, which is probably the largest and airiest on the continent. Strict discipline is enforced; tobacco and newspapers are prohibited, loud and unnecessary talking is forbidden, and altogether there is an air of business about the place that was not to be found in the old quarters. Mr. John Benckert, an old operator and very popular, has been appointed Assistant Manager.

At a meeting of the Franklin Institute last week, the President, William P. Tatham, in the chair, nominations for officers for next year, to be elected at the next meeting, were made. Mr. Tatham declined a renomination as President, and, Charles H. Banes was nominated as his successor. Vice-President, Charles Bullock; Secretary, Gilliam H. Wahl; Treasurer, Samuel Sartain; and Auditor William A. Cheyney, were renominated.

The following named gentlemen were nominated for managers, to fill the places of seven whose terms will expire, namely: Frederick Fraley, Persifor Frazer, William Helme, Edward J. Houston, Enoch Lewis, William H. Thorne, John J. Weaver, William P. Tatham, William D. Marks, Charles H. Hutchinson, E. Alex. Scott, George V. Cresson, William L. Boswell, Samuel R. Marshall, H. P. Hand and William H. Greene.

A vote of thanks was tendered to Mr. Tatham for the manner in which he had discharged the duties of his office.

The holidays afford your correspondent an opportunity of taking a run through the State, and a few notes taken by the way may prove interesting to electricians.

At Lancaster, seventy miles west of Philadelphia, we found an interesting fight going on between the city authorities and the local electric light company. The Weston Electric Light Company has a very complete plant here, furnishing 140 lights for the streets of the city. Their contract expired on December 12th, and as the company demanded an increase in compensation of 2½ cents per lamp per night, and the City Councils refused this demand, the city looked as though it would have to return to gas. The electric light company, however, went on lighting the city, in the hope that some arrangement could be made, and on the 17th inst. both branches of Councils met in special session to consider the subject. The debate was long and spirited, but it was apparent that there is an overwhelming sentiment among the people of Lancaster in favor of electricity. On one side it was argued that the city could save $3,400 in three months by accepting the proposition of the gas company, while on the other side statistics were quoted showing a great decrease in crime at night since electricity superseded gas in the streets. Finally both branches of Councils voted in favor of contracting with the electric light company to light the city from January 1st until June 1st at 40 cents per light per night.

Holman and Snyder, the belt manufacturers of Lancaster, are having quite a good sale for their belt among electric light companies. We learn that the belts are giving entire satisfaction.

The Edison Company have established a small incandescent plant here, and intend increasing it in the spring. The plant is now used to light the clothing store of Myers & Rathfon. Mr. W. F. Wollin is in charge of the plant.

At Pottsville, a thriving town in the coal and iron region, the electric light is very generally used by private firms, and at a meeting of Councils on the 15th inst. it was decided to do away with gas and coal oil in the street lamps and to light the streets of the entire town by electricity.

At the capital of the State, Harrisburg, electrical matters have been quite lively during last week. Some of the city officials and the newspapers have recently been making a terrific onslaught upon the aerial lines, claiming that the wires must go under ground. On Dec. 14 an ordinance ordering all wires to be placed under ground came up before City Councils. Superintendent Ker, of the telephone company, addressed the local statesmen. He read extracts from a report made by a commission in Brooklyn to examine and report upon the feasibility of burying the wires. This report stated that after examining six hundred methods, the commission was of opinion that no permanent underground system has yet been discovered. Mr. Ker said it is simply an impossibility, after the most thorough tests, to put telephone wires under ground. The electrical difficulties are many. There are nearly three hundred subscribers in Harrisburg, ranging from Lucknow Forge to Steelton, and the expense alone is appalling. Mr. Ker, continuing, said that the telephone company is making 6 per cent on its stock. At the lowest cost it would take $750,000 to put the cable under ground in five towns controlled by his company. The increase in rental here would be so great as to almost prohibit its use.

John I. Beggs, representing the Harrisburg Electric Light Company, also made an able address. He said that all that Superintendent Ker had said about telephones would apply to electric light wires. He submitted that it was not fair to give the light company the right to put up poles and wires and then make it remove them in a year. The company in its short existence has forced a big improvement in the quality of gas.

After long argument a poll was reached and, by a vote of 6 to 3, the proposed ordinance compelling the wires to be placed under ground was indefinitely postponed. Before the adjournment a member presented another ordinance, which was referred to the Highway Committee, compelling all telegraph wires to be placed under ground. It is the same in its provisions as the defeated underground wire ordinance, except that it does not apply to telephone and electric light companies.

S. W. Entrekin, the proprietor of the Keystone Electric Works, has things pretty much his own way, as there is no other firm here in the business. He is kept constantly busy putting in annunciators, etc. He has just completed putting in a 160 room annunciator in the United States Hotel here. He is also the patentee of a superior call bell and burglar alarm.

E. F. I.

PITTSBURGH, Pa., Dec. 18, 1885.

The electrical field is broadening here very rapidly and each day sees some new development. There is now in act of incorporation an electric light company, to be known as the Westinghouse Electric Company. The application for incorporation will be presented to the Governor of Pennsylvania, January 8, 1886, by the following gentlemen: Geo. Westinghouse, Jr., C. H. Jackson, H. H. Westinghouse, John Caldwell and Frank G. Pape. I understand they are to manufacture the Stanley incandescent lamp and a dynamo of the Siemens pattern. This company has several large contracts for electric light plants, among which are a 300-light machine for lighting completely the large building of T. C. Jenkins, on Liberty street, the Monongahela Hotel. The Pittsburgh Club has now a 300 light plant, which gives entire satisfaction. They also have a contract for putting in a plant for commercial lighting in Trenton, N. J.

The Standard Underground Cable Company speak of business as encouraging, and report eighteen miles of cable being laid for the Chartiers Valley Gas Company from Chartiers to their gas wells at Murrysville. They have just shipped some cable to the Central Union Telephone Company of Chicago, for use in Bloomington, Ill.; also to Chicago Telephone Company, and some to New Orleans.

A recent test was made of this company's electric light cables in Philadelphia with the Brush light heaviest current, and it worked splendidly.

The Pittsburgh Electric Company are doing a nice business in supplies. This company are also the agents for the Thomson-Houston and Edison Electric Light Company systems here, and report this branch of the business on the increase.

At Johnstown, Pa., they are just stringing the wires for the establishing of a plant of the Edison incandescent system. The Cambria Iron Works at this place have a Brush plant which lights their entire property.

The Allegheny Co. Electric Light Company will commence on Monday next to do wiring throughout the city for establishing incandescent lights for use in dwelling-houses, stores, hotels, etc. This company have, for some four years past, been furnishing the Brush arc light, and have just recently added the incandescent branch to their business. They will use the Stanley incandescent lamp made by the Westinghouse Company. The officers of the

company are Joseph S. Brown, President; John E. Ridall, Vice-President; Robt. D. McGonigle, Secretary and Treasurer; S. A. Duncan, Superintendent.

Mr. Dickey, of the Pittsburgh Carbon Company, reports business as very good. Their works are running to their full capacity, and they find it difficult to supply the demand.

The McTighe Electric Light Company are establishing new plants which promise to give entire satisfaction. They manufacture a fine light.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, Dec. 19, 1885.

Electric lighting in the West has made rapid and very satisfactory progress during the year just closing. There is not an electric lighting company, with one exception, which has not strengthened itself in every way during the past year; that has not added largely to the number of plants which it had at the beginning of the year; that is not in better shape financially than it was twelve months ago; and that has not on its books more orders, in hand more work, and in prospect more contracts than it had on Jan. 1, 1885. The single exception noted is an exception not because of lack of business, but because of reasons connected with the settlement of an estate which has temporarily only stopped its machinery.

Nor has the progress noted been confined to one branch of the business only, for both arc and incandescent lighting have made rapid strides forward, the advancement as a whole having been probably much greater and much more satisfactory than the most sanguine enthusiast in the business could have looked for at the beginning of the year.

It may, perhaps, be interesting to briefly review what has been done during the last twelve months in a few of the larger Western cities.

In Chicago, practically all the restrictions on electric lighting, as far as hostile city ordinances are concerned, have been removed. By *all* the restrictions I mean those that were practically prohibitory in their character. The commencement of this different condition of things in this city was in June last, when such an arrangement was effected between the city, the Conduit Company and the electric lighting companies as made it possible, or at least will make it possible as soon as the work now in progress is completed, for each and every block of the entire city to be served with electric lights to any extent desired. Since that time lights have been going in rapidly. The work has been better done, and the demand for lights is increased. The number of arc lights put in since that time runs into the hundreds, and incandescent lighting has gone forward with even more rapidity. Two single contracts for incandescent lighting, which were completed in Chicago during the year, aggregate one hundred and twenty-five thousand dollars. It may be imagined, now that the restrictions referred to have been removed, with what better prospects, as compared with twelve months ago, the companies doing business in Chicago will start off in 1886.

In St. Louis, where the companies have not been hampered by unreasonable restrictions, the business has been conducted with exceedingly favorable results. Besides a large number of isolated plants, St. Louis has a central arc light station, which, on the occasion of the writer's last visit there, was expected to be soon furnishing current for six hundred lights: then there is another station of three hundred and fifty lights, another of two hundred and forty, another of one hundred, and several smaller stations. The incandescent branch of the business is being pushed there vigorously also. All the leading companies are represented, and most of them have established local offices for the purpose of more thoroughly covering the field.

The incandescent light has been introduced into the Custom-House, *Globe-Democrat* office, Exposition Building, several of the hotels and theatres, and into a large number of the more important business blocks. Certain it is that St. Louis never had as many electric lights as now, that the manufacturing companies were never so well represented there as at the present time, and that the local companies never before experienced so satisfactory a condition of things as they are now enjoying. It might be added here, also, that East St. Louis is one blaze of electric lights at night.

In Milwaukee, after a long struggle with the city authorities, the companies have triumphed and work is now rapidly going on in the direction of a large addition to the number of lights already there. Here is another city which will start off next year with the field clear of restrictions in comparison with twelve months ago.

Concerning Detroit, famous the world over for its magnificent electric light tower system, it is necessary only to say that its city lighting system, which was very large and very near perfection at the beginning of the year, is a little larger and a little nearer perfection at its close. Besides, the isolated, arc and incandescent plants have increased, and the people, one and all, who are not holders of the local gas stock are in favor of the electric light.

Cincinnati, whose electric arc lights were estimated by the writer in May last to be five hundred in number, has since that time received sufficient attention from the electric lighting companies that not less than seven hundred and fifty arc lights are burning there at the present time nightly. Incandescents show a proportionate increase, and the manufacturing companies are better represented, with brighter prospects for business now than at the same time last year.

Indianapolis during the last year has had a manufacturing company located in its midst; has had a respectable number of new plants installed, and is to have more in the near future. There has been a local company put in operation in West Indianapolis also.

It is impossible in our limited space to treat a further number of Western cities individually. Kansas City, in the words of a late informant, "is being filled with electric lighting apparatus now:" La Fayette, Ind., has a prosperous local company; Fort Wayne has concluded during the past year that it had better be lighted by electricity for some time to come, and there are actually in the neighborhood of two hundred and fifty arc lights in that little city; Elgin, with a tower system equally famous with that of Detroit, has increased its plant; and the smaller cities and towns which have either added to the plant within their limits, or seen the light for the first time, are almost without number.

Electric lighting has gone ahead in the West during the past twelve months, and this with a vengeance.

The Bankers & Merchants' Telegraph Company have leased a room in Indianapolis, and are fixing up an office. Their wires, four in number have been in here for the past two years, but no connection has been made, owing to financial trouble. There is a prospect for a fight with the city authorities now that they have begun operations, as the ordinance giving the Bankers & Merchants' Telegraph Company rights on streets and alleys stated: "That in case they should sell out to or consolidate with any other company, the privileges granted should be forfeited." It is claimed that the consolidation of the different companies under the title of "United Lines Telegraph Company" is in direct violation of the ordinance. H. E. Kinney, formerly a grain broker in Indianapolis, is manager; he is a live, energetic man, and will no doubt get his full share of the telegraph business here.

Argument before the Supreme Court in the telephone cases took place Tuesday and Wednesday, and the court took the matter under advisement. A decision is looked for by the 1st of January.

I notice an item in the papers from Crawfordsville, Ind., saying: "The Crawfordsville Gas Light Gompany have so amended their articles of association as to allow them to manufacture light by electricity as well as gas, and will purchase an electrical plant to be placed in their works." The gas company in Indianapolis made the same change something over a year ago, but nothing has been done so far in the way of putting in machinery, etc.

The Chicago, St. Louis & Pittsburg Railway Co. (Panhandle) and the Cincinnati, Indianapolis, St. Louis & Chicago Railway Co. (Big Four), have taken the electric head-lights off engines where they have been trying them for some months. The light has given satisfaction on all sides, with the exception that it is so bright and strong, it makes the signal lamps rather dim, though an engineer would probably become used to them, so this would be no objection. The companies claim it would cost them about 400 dollars for each engine to fit them up for electric light, which is more than they can afford at present.

Shortly after one o'clock, the other morning, the purifiers of the gas company in Kansas City exploded, demolishing the entire works, and stopping the supply of gas furnished to patrons. Before noon that day lamp dealers reported sales of over ten thousand dollars, and the electric light company received orders for over three hundred lamps. All kinds of oil burners and candles advanced a hundred per cent. in price, and altogether it was a "field day" for dealers in those wares. The Edison incandescent plant in the *Times* building has been giving good satisfaction, and being the only plant of the kind in the city, it has been critically examined.

The Missouri & Kansas Telephone Company is constructing a line from Topeka south to Burlingame, connecting with the Ottawa system. Copper wire is now used by this company for all toll lines to the exclusion of all other kinds.

The United Telephone Company have almost completed their system of lines connecting the exchanges at Wichita, Wellington and Winfield. Iron poles made from large gas pipe and tarred at the end, and paper insulators have been used, and have been found to work splendidly. Supt. McDaniel has constructed a unique climber for the iron poles so as to facilitate repairing and line work. Three iron poles, can be put into position in the same time that one wooden one can be put up, so that there is a large saving in the item of construction alone.

The Kansas City employés of the Missouri & Kansas Telegraph and Telephone Co. gave their annual ball on the 10th at Music Hall. The dancing floor and balconies were crowded to their utmost, and the electric exhibition and miniature exchange were much admired.

Kansas City has entered into a contract with the Electric Light Company to furnish a number of lights on the principal streets.

The Western department of the United States Electric Lighting Company is just furnishing plants for the Gillis House and Kansas City Bank Note Company, aggregating nearly four hundred incandescent lights, in Kansas City.

The Brazil Electric Lighting Company, of Brazil, Ind., who began operations about two weeks ago, are meeting with success and giving satisfaction. They have bought ground, and will immediately erect a building of their own.

The Indianapolis Jenney Electric Company furnished the machinery, dynamos, lamps, etc.

I notice in the papers an item from Wabash, Ind., saying that the company organized there under name of Wabash Electric Light and Power Company, have abandoned the idea of beginning operations at present at least, and have surrendered the charter granted them by the city.

Mr. Woolley, electrician of the Woolley Electric Locomotive Headlight Company, of Indianapolis, has severed his connection with the company. The company claim to have things in good shape, and expect soon to be able to put their goods on the market. At present they are looking for some one to take Mr. Woolley's place.

The Van Depoele Electric Manufacturing Company, of Chicago, commenced shipping the material on the 12th inst. for a sixty-light arc plant for Des Moines, Ia.

W. A. K.

CINCINNATI, O., Dec. 19, 1885.

The Merchants' Police Company of Cincinnati is meeting with great success. The company was reorganized last May. It then had five beats, but has now established forty and has two thousand subscribers. It employs forty regular watchmen, ten substitutes, and four specials. There are four officers of the company in the counting-room. There are three clerks and three collectors; total, sixty-four men. The business of the company is to watch at night the property of subscribers, each of whom pays monthly, the rate being fixed according to the value and extent of the property watched. The watchmen are uniformed and furnished with clubs, dark lanterns and the whistles. They assemble for roll-call, inspection and instruction daily, going to their beats at 6 o'clock P. M. They reassemble at the office at 6 o'clock in the morning and make a report. Some of the beats are wired and equipped with electrical watch-clocks and switch-boxes. The watch clocks are not placed in the company's office, but in some subscriber's office on the beat. By this arrangement the company is freed from all suspicion of tampering with the watch-clocks. Any subscriber can visit the watch-clock at any time and see for himself whether the watchman has done his duty or not. In addition to registering his half-hourly visits on the watch-clock, the watchman also reports by wire at the same time to the night operator at the company's office. By means of this wire from each beat to the company's office, the watchman is enabled to call for a messenger or demand assistance without leaving his beat. The company has the confidence of the press and the public, and many testimonials to that effect. The officers of the company are E. C. Armstrong, president: J. O. Shiras, secretary and treasurer. These gentlemen are the pioneers of the telephone in Cincinnati, they having introduced it there practically in August, 1877. Mr. Armstrong introduced the patrol wagon system there also. The officer in charge of the men is Capt. W. H. Devine, who was long connected with the Police Department of Cincinnati, as captain and inspector. The general superintendent is Col. W. H. Reilly, who also has long been connected with the Police Department of Cincinnati, and who has just resigned his position of superintendent of the patrol wagon service to accept his new position with the Merchants' Police Company. The long experience these two gentlemen have had in police affairs eminently fits them for their new positions.

THE TELEGRAPH.

Levied On.—The Western Union Company has allowed itself to be levied on in this city for the unpaid taxes mentioned in our issue last week. It is said a compromise will be made.

Mr. Cyrus Field's Libel Case.—In the case of Cyrus Field *vs.* James Gordon Bennett, an application has been made in London for fuller answers to interrogatories administered by the plaintiff; but the Court of Appeal dismissed the application, holding that the answers given were sufficient.

The United Lines Transferred.—A deed has been filed in Toledo, Ohio, from John Whalen, Referee to the United Lines Telegraph Company, transferring the corporate rights, privileges, and franchises of the Bankers and Merchants' Telegraph Company, etc., to Edward S. Stokes, for the sum of $500,000.

United Lines.—A dispatch from Baltimore of Dec. 17 says that the lines of the Bankers and Merchants' Telegraph Company were bought in on that day by Mr. Taxworth of the Southern Electric Company for $25.000. He was acting for the United Lines Company. Mr. Cohen, of New York, counsel for the latter company, supplied the purchase money.

The Pensacola Telegraph Company.—Judgments having been obtained in the local Circuit Court against the Pensacola Telegraph Company, the lines and property of that company will be sold on the 4th of January, 1886, to satisfy these judgments. Unless others than the Western Union Telegraph Company are bidders, the property may sell for half its value.

Telegraphic Litigation.—In Baltimore, on December 19th, Judge Fisher issued an order that the United Lines Telegraph Company shall use the wires of the Bankers and Merchants' Company, which it purchased a few days ago. The condition is that there shall be no appeal. The receivers objected on the ground that the United Lines Company has once before failed to fulfil an agreement, and they were unwilling to surrender the property until the purchase money is paid or secured.

The Standard Company.—The Standard Telegraph and Conduit Company has filed articles of incorporation in the County Clerk's office, New York City. Its object is to establish telegraphic communication between this city and various cities in New York, New Jersey and Pennsylvania. Its capital is $2,500,000, and conduits are to be used if necessary. The incorporators are Frederick Homer, Frederick Dolman, Alexander H. Siegel, Richard H. Spencer and Julius Hirschfeld.

A New Organization.—The Postal Telegraph and Cable Company, No. 3, of Philadelphia was chartered Dec. 1. It will run from Carbondale to Harrisburg through Lackawanna, Luzerne, Columbia, Montour, Northumberland and Dauphin counties. The capital is $50,000; the incorporators are Philadelphia and New York parties. They have already built a line of poles to Scranton, Pa., and intend opening there for business in a few days.

A Suit Arranged.—The case of C. W. Brega against the Board of Trade Telegraph Company came up again in Chicago on Dec. 18 before Judge Moran, and after considerable talk, the parties entered into a stipulation that a meeting of the directors of the company should be held at the Grand Pacific Hotel on Jan. 11 next, for the election of officers and other business. John H. Hall, Judge Moran's clerk, was then appointed receiver to take possession of all the company's books, records, documents, and other assets not now in possession of L. D. Parker, the receiver of the Bankers and Merchants' Telegraph Company.

An Operator Killed.—Hawthorn A. Kennedy, of Leaman Place, Pennsylvania, an extra telegraph operator on the Pennsylvania Railroad, met with a terrible accident on the 14th inst. He had relieved the operator at Kinzer until after midnight, and then started to walk to his home, three miles away. Near Leaman Place he fell from a high bridge over Eshelman's creek headlong to the rocks and stones thirty feet below. As the water is only four or five inches deep, it did not break the shock, and Kennedy's skull was badly fractured and he died next day. He was eighteen years old and the only support of his sister and invalid father.

Postal Press Telegraphs.—A special dispatch of Dec. 17 from Washington says: William F. G. Shanks, President of the National Press Intelligence Company, of New York, made written application on Dec. 14 to the Senate Committee on Post Offices and Post Roads for a hearing on the Edmunds bill in behalf of a telegraph company organized by him in New York for the transmission of commercial correspondence and press dispatches by machinery over a new compound wire. Senator Conger, of Michigan, to-day arranged for a hearing of representatives of the company, by the committee, some time in January.

The B. & O. in the South.—The Arkansas Telegraph Company completed its new line between Little Rock and Hot Spring Dec. 16, and opened the same in connection with the Baltimore & Ohio Telegraph system. This is the line about which there has been so much conflict between the Arkansas Telegraph Company and the employes of the Western Union Telegraph Company, and the St. Louis, Iron Mountain & Southern Railroad Company. The Supreme Court of Arkansas last week affirmed the judg-

ment of the lower court, giving the Arkansas Company the right to build its line on the right of way of the railroad company.

To Help Messengers.—In this city, on the 16th inst., the juvenile Oakland Minstrels tried hard to please a large audience at Turn Hall. Nearly all of the performers were boys employed by the Mutual District Messenger Company. The object is to procure uniforms for boys who would like to enter the messenger service, but who cannot afford to buy uniforms. In the first part C. Warn, a little fellow whose face was thickly covered with burnt cork, sang "Take Back the Heart that Thou Gavest" as though he meant it. He was rapturously applauded. Then came a messenger drill and a good many little acts that made everybody laugh. E. B. Sanger, better known as Messenger No. 22, imitated Dixey's imitation of Henry Irving. His make-up was admirable, and his rendering of "It's English, You know," was only second to Dixey's. The receipts were about $150, half of which will pay all expenses, and the other half will be the foundation of a fund for helping along the poor boys.

West Shore Lines.—It is said that, by the lease of the West Shore to the Central, the valuable telegraph contract of the Baltimore & Ohio with the former falls into the lap of the Western Union. The telegraph lines referred to were built by the North River Construction Company with its own funds and capitalized as a separate company. The entire concern was sold by the Construction Company to the Baltimore & Ohio about two years ago for $500,000. The original West Shore first mortgage did not cover the telegraph property. The line, of course, stands upon the premises mortgaged, under certain agreements with the original mortgagor. The New York *Sun* says: "So far as can be learned, no questions relative to the matter have been raised except in the street, and those in a position to judge say that the railroad company is not likely to move in the matter against the Baltimore & Ohio and in favor of the Western Union Company."

Chicago's Underground Wires.—A dispatch of Dec. 18 from Chicago says: There are, as nearly as can be estimated, about 15,000 miles of wires in Chicago, used by the telegraph, telephone, and electric light companies, besides countless private lines. According to the reports received by Mr. Barrett, the city electrician, from the various companies last December, there were shown to be about 1,100 miles of wire under ground. Since then the work has been actively going on, and during the present year about three times that amount have been put out of sight. At present the wires belonging to the city, the Postal, and the Bankers and Merchants' Telegraph, besides those of a number of electric light companies, are under ground, and the poles from which they hung are being cut down. The Western Union Company is placing its wires in pipes as rapidly as possible. Mr. Barrett says the underground idea is spreading throughout the country, and the insulating factories are in consequence pushed to the utmost capacity to supply the immense demand, some of them being at least six months behind in their orders. In his opinion the companies are doing all in their power to live up to the ordinance, and that by May 1 all the wires in the business portion of the city will be under ground, though it will probably take at least ten years to place all the wires throughout the city there.

The Obduracy of the Western Union.—However useful Section 435 of the code may be, says the New York *Times*, for muzzling free speech (it appears that some of the brokers who send out circular letters to their customers were threatened under it), it cannot increase railroad earnings or the earnings of telegraph companies; if it could the Western Union Company would not have had to reduce its dividend from 6 to 5 per cent., which was done at the last quarterly meeting. The stock hangs at about 73 in the market, and seems almost as ready to go down as Texas Pacific did. There is a sheriff in the office of the company trying to collect some overdue taxes, and this fact leads some people to believe that Mr. Gould is not at this time anxious to bull the stock. The money could be readily paid by the company, and payment under protest would protect all legal rights; but it does not sound well to have it talked about that the sheriff is levying on the property of a corporation, and the effect on the stock is depressing. Mr. Field is anxious to sell his holdings to the Government at par, and doubtless every one else who holds Western Union would be willing to do the same thing. They might possibly be persuaded to part with the stock at a trifle less. Mr. Field's extreme anxiety at this time to find a market for Western Union may be taken as an indication that he has had a glimpse into the condition of the company which has not encouraged his hopes for its future.

Treated by Telegraph.—A dispatch of Dec. 20, from Kingston, N. Y., says: Miss Ora Misner, aged 21 years, daughter of George Misner, a well-known farmer residing at Big Indian, a small hamlet a few miles from here, took an ounce of laudanum at 10 o'clock yesterday morning. The parents of the girl went at once to the railway station to telegraph Dr. Schley, at Pine Hill, three miles west, to come quickly. The operator working the Big Indian wire in the main office of the Western Union Telegraph Company in New York, having overheard the message summoning Dr. Schley, asked the Big Indian operator about the case. Learning the situation of affairs and appreciating the necessity of immediate medical treatment, he consulted with two brother operators on duty at the time, who had graduated from a medical college in New York. These two operators then told the Big Indian operator what remedies should be applied and gave full directions as to treatment. Following their directions, powerful emetics were administered, which proved effective. They also prescribed vigorous rubbing and whipping with small twigs to keep the girl awake. Dr. Schley, who arrived an hour later, said the girl's life could not have been saved had not the New York operators prescribed for her. This morning Miss Misner was pronounced to be out of immediate danger. Her reason for attempting suicide is unknown, but it is supposed that her effort at self-destruction resulted from a love affair.

The B. & M. Sale.—A dispatch of Dec. 17 from Baltimore says: All the property of the Bankers and Merchants' Telegraph Company of every kind and description in the State of Maryland was disposed of at auction to-day. The sellers were Messrs. F. H. Stephens and Francis W. Jones, receivers, who acted under a decree of the Circuit Court of Baltimore. The order of the court was to the effect that the receiver should close business on this date at 9 A. M. Accordingly at that hour all of the wires were cut and business necessarily suspended. The sale was largely attended. The whole property, comprising wires, fixtures, franchises, instruments, etc., was started in one lot at $10,000, the bidder being William A. Dunn of the Cable Company, and was finally knocked down for $25,000. The successful bidder was D. Howard Tuxworth, of the firm of Morrison & Tuxworth, who signed for the Southern Electric Company. William N. Cohen, the attorney for the United Lines, paid out the money, however, giving a certified check for $5,000, three $1,000 bills and some smaller money to ratify the sale. As soon as the wires can be connected the offices will be opened as usual for business. The sale was clear of all incumbrances. Mr. Stevens said this morning that he thought the $1,000 indemnity fund deposited by the United Lines Company when the court decreed that the receivers should take possession, would cover all deficiencies in the running expenses. The employés will be paid by the receivers up to date.

THE TELEPHONE.

Edison Telephone Patents in Canada.—The Ministry of Agriculture of the Dominion has upheld the validity of the Edison patents now owned by the Bell Company, and by means of which the company still has a monopoly of telephony in Canada.

Wooden Casing.—Mr. Frank T. Wyckoff, of Williamsport, Pa., has just completed a lot of his wooden casing at his factory, Portsmouth, Va., for the Bell Telephone Company of Philadelphia, which the company propose to use in that city to incase their wires in underground.

Experiments with the Microphone.—In the Atlanta *Medical and Surgical Journal*, Dr. Eve describes an interesting series of experiments made by him with the microphone. He was able to detect the nature of obscure fractures by the character of the sounds conducted through the instrument, and could differentiate aneurisms from tumors by the sounds of pulsation. Intracranial and muscular sounds were made out with great clearness, and in diagnoses for stone the instrument worked with mathematical accuracy. The doctor suggests that an audiphone constructed on the principle of the microphone would prove inestimable to people of impaired hearing.

THE ELECTRIC LIGHT.

St. Paul, Minn.—The bustling city of St. Paul is to have an ice palace this year, after the pattern of that at Montreal. It will be lighted by electricity.

Schenectady, N. Y.—The Schenectady Gas Light Co., Schenectady, N. Y., are putting in a Thomson-Houston electric light plant. The contract for the steam plant has been placed with the Jarvis Engineering Co. of Boston.

Domestic Electric Lighting in Paris.—M. Menier, the well-known electrical engineer and contractor, has purchased a large property, Rue de Chateaud'un (Paris), and is rebuilding it on a new system. He will sell electric light to all the lodgers in the house at a reasonable rate. It is the first time this speculation has ever been tried in Paris.

Electric Lighting for Railroads.—Alpha Child, in a letter to the Boston *Transcript* on the comforts of German railroads, says: "Wurtemberg has gone a step beyond these things; the train on which I left Stuttgart for Tubingen had electric wires running overhead through every car, from a dynamo machine on the locomotive, and the lights in every car and compartment flashed up the instant the train entered a tunnel (there are several on this road), and out they went as the train emerged into daylight again."

The New Toboggan Slide at Saratoga is lighted by arc lamps: "In the evenings the scene will be one to be remembered. Throughout its entire length Broadway is lighted by electricity, and at the slide the soft but penetrating light of eight lamps outdo the Christmas moon in shedding the "lustre of midday upon objects below." The gay blanket costumes of the members, with their graceful togues and girdling sashes; the chutes and slide a resplendent crystal floor for the skimming sleighs; the bridge fringed with varicolored Chinese lanterns—the whole against a background of spotless snow and rugged winter scenery, will combine to produce an effect not easily duplicated."

Trenton's Dark Streets.—It is proposed to increase the electric lighting plant at Trenton, N. J. Mayor Donnelly is one of the officers of the company, and the others are all leading citizens The company's proposal to the city has many advocates, and there is hope that it will be favorably considered. One of the arguments in favor of the new light is that the city during the coming legislative session should try to look its prettiest and afford all possible conveniences to the law-makers, so as to give as little ground as possible for a renewal of the effort to take the Capitol to Newark. At present the streets are poorly lighted, and after the evening sessions one has almost to feel his way along from the Capitol to the hotels.

APPLICATIONS OF POWER.

A Telpher Line for Trinidad.—It has been proposed to lay down a telpher line in the island of Trinidad, West Indies, to bring produce to the coast. The conveyance at present, by mule-back, costs about $2 a ton.

PERSONALS.

Mr. T. A. Edison is said to be at work on a modification of his phonograph, and to be projecting a trip to Chili.

Mr. Miles W. Goodyear has been unanimously elected Senior Warden of U. S. Lodge 207, A. F. and A. M. Mr. Goodyear seems to be as popular in the various organizations he belongs to as he is in electrical and business circles, and though he holds many offices, his friends, including Civil Service reformers, try to crowd more on him every year.

Mr. T. D. Lockwood's lectures before the Lowell Institute, Boston, on telegraphy and telephony appear to be affording much pleasure and instruction to his audiences. The reports published by the local papers give evidence that Mr. Lockwood has mapped out a very judicious course, and is presenting the subject in a bright and helpful way.

Mr. Charles Batchelor.—Several of the workers and inventors who have been more or less associated with Mr. Edison are, like himself, within a month or two of forty years old—such as Mr. E. H. Johnson, Mr. Gardiner C. Sims and Mr. Charles Batchelor. We are not, therefore, surprised to hear of a little festive meeting of these and other gentlemen of two score in honor of the fortieth birthday of Mr. Batchelor, who has done so much to push the Edison electric light system in Europe.

Mr. A. T. Ballantine, deeming it essential and necessary for him to give his entire time to the Ice Machine Department of the Cummer Engine Company, which will prevent his being able to give any attention to the management of the shops, has resigned the position of superintendent. Mr. Alfred Clarke has been appointed to that position, the appointment to take effect at once. The directors express their high appreciation of Mr. Ballantine's services while superintendent, and of the great improvements and system introduced in the works by his personal efforts, and while they agree with him that it is necessary for him to give more time to the growing business of ice and refrigerating machinery, they regret his loss as superintendent.

Mr. John H. B. Latrobe, at the recent banquet given to Mr. Robert Garrett by Mr. Erastus Wiman and other Staten Islanders, offered the following among other reminiscences: Congress had appropriated $30,000 to enable Morse to test, in actual use, his telegraph, whose demonstrations had so far been limited to the transmission of messages from one committee room in the Capitol to another; and as the Washington branch of the Baltimore & Ohio Railroad afforded the most convenient opportunity, he applied for permission to establish a wire upon it. A question as to the company's power in the premises having arisen, the President, Mr. Louis McLane, suggested that I should find out something of the matter, of which both of us were ignorant. A single interview with the inventor imbued me with his enthusiasm; and my report to the President was that, numerous and exalted as had been the positions he had held, his name would be forgotten, while that of Morse would be echoed throughout the ages, or something to this effect. Mr. McLane now became enthusiastic himself, and when the resolution granting the permission came before the directors the only dissenting voice was that of a member who said that he could not conscientiously be a party to what would help Mr. Morse, who seemed to be an honest man, to ruin himself by prosecuting so impracticable a scheme. Thus it was that the Baltimore & Ohio Railroad Company became interested in telegraphy in the infancy of the art, and it now, after many years, finds itself again engaged in promoting and cheapening its usefulness.

MISCELLANEOUS NOTES.

Magnesium by Electrolysis.—The production of magnesium having been cheapened by a new electrolytic process, efforts are being made in Europe to extend its use as a source of light. Two prizes, $125 and $50, have been offered by a Bremen firm for the best designs for magnesium lamps with clockwork movement.

Erratum.—The article entitled "Profitable Section of an Electrical Conductor for Transmission of Power," in our last issue, contained two trifling typographical errors, which, however, it is just as well to correct.

They are, viz.: The last two words of the fifteenth text-line, third column, which should read "45 (*vice* 108) ampères;" also the proportion and equation following the forty-first text-line of same column, which should omit the plus sign that connects them, and be arranged thus:

$$100.86 : 100 :: 2642 : 2619$$
$$2642 - 2619 = 23.$$

The Pratt & Whitney Company.—This eminent firm of Hartford, Conn., so long famous for its good taste and sound judgment in matters mechanical, has now given evidence of its keen appreciation of superiority and merit in other lines. It has just sent out to its many friends a large colored picture of the well-known actress, Miss Fortescue, around the vignette of whom are massed flowers and ferns. The picture, made by the Forbes Company, of Boston, is an admirable work of art, and will be given a prominent position by all the recipients. The firm's "standard of beauty" does it as much credit as their other standards, with which the mechanical fraternity is so familiar.

"Johnston's Journal."—The contents of the December 12 number are most timely and interesting. The illustrated articles are: "A Visit to the Murrysville Gas Wells," by Jacob F. Henrici, with three large illustrations; "Bulgaria and the Bulgars," with six illustrations; "The Realm of Bloody Theebaw," with four illustrations; and the article on the steam engine, by Joshua Rose, M. E. There are two illustrated book reviews; an analysis of the memoirs of General Grant; and miscellaneous articles, including one on the succession to the Presidency. The contents include also various pieces of poetry, the departments and a good comic sketch. 36 pages, 10 cents a copy, or $2 a year.

Guarding Vanderbilt's Tomb.—Every night at 6 o'clock four of Pinkerton's detectives, armed with heavy navy revolvers, take the place of three similarly armed men who, during the afternoon, have been on guard at the tomb of William H. Vanderbilt. Other guards are concealed in the bushes, while the roads are well watched. Some of the precautions taken are such that an account of them cannot be published. The niche in the vault in which the coffin of the dead millionaire is placed is connected with an electrical alarm, and, even if a tunnel could be driven to the tomb, any attempt to remove the body, or any tampering with the wires, would be made known immediately at the headquarters of the detectives. A registering alarm clock has been placed near the gate of the vault, and at short intervals the guard is required to register. No attempt at removal is expected in view of the precautions taken, but the watch will be maintained until the mausoleum is finished.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—Western Union, b 72¾, a 72¾.

Telephone.—Am. Bell, a 174½; Erie, b 28½, a 28¾; New England, b 32. The Boston *Herald* of Dec. 20 says:

Bell telephone stock had a lively dance, falling from 180 yesterday to 165 this morning, and rallying quickly to 174,

with later recovery to 175. The price tumbled on the false rumor that Secretary Lamar had decided that the validity of the company's chief patent must stand the test of law, and rallied on the report that no decision had been reached or was likely to be reached for a fortnight. New England telephone strengthened to 32. Dividend prospects are thought not to improve much, and as other companies than the New England are asking concessions from the Bell, it is feared that the parent company will concede nothing. The result is that some stockholders are selling out.

Electric Light.—No new quotations.

BUSINESS NOTICES.

[Copy.]

W. H. GESNER, SUP'T.

OFFICE OF
THE BRUSH ELECTRIC LIGHT AND POWER CO.,
MONTGOMERY, Ala., Nov. 17, 1885.

Messrs. Giles, Bro. & Co., State and Washington Streets, Chicago, Ill.

DEAR SIRS: I have to acknowledge receipt of my watch with magnetic shield. Please accept my thanks.

I have given the watch a thorough test—held it all about the field magnets of a No. 8 Brush machine, running at 750 rev. per minute and supplying 52 arc lamps, without visible effect.

I consider your magnetic shield a perfect protection from magnetism.

I have ruined three or four watches heretofore, and have spent money enough for repairs to buy a dozen shields almost.

Very truly yours,
W. H. GESNER, Sup't.

Prize Belting.—The "Electric" leather belting of Charles A. Schieren & Co. has been awarded the bronze medal of superiority, at the last (54th) annual exhibition of the American Institute.

The Standard Underground Cable Co., who have been so successful with their system (known as the Waring cables) for telegraph, telephone and fire-alarm purposes, have now entered the market with electric light cables, and claim for them every requisite for successful underground work. Their confidence is supported by their readiness to guarantee every piece of work done.

The Ide Engine.—The Foundry and Machine Department of the Harrisburg Car Manufacturing Company make the Ide Engine for Eastern trade, and have filled some large electric light installation orders lately. The Edison plant at Harrisburg has three 150 horse-power Ide engines and one 80 horse-power. The McTighe people, of Pittsburg, have one of 40 horse-power. At Washington, D. C., the United States Company have just put in one; and five have been put in for the United State Company's plant in the Cook County Buildings, Chicago. Outside the electric lighting field, the engine enjoys a high reputation as well as in it, and the above company have just been awarded a silver medal and diploma for the best automatic high-speed engine at the Novelties Exhibition.

The Fitchburg Engine.—The following parties are now using the engine of the Fitchburg Steam Engine Company for electric light plants: Consolidated Electric Light Co., Portland, Maine, two engines, 75 horse-power each; Salem Electric Light Co., Salem, Mass., one 75 horse-power engine; Wachusett Electric Light Co., Fitchburg, Mass., two 75 horse-power engines; New Britain Electric Light Co., New Britain, Conn., 50 horse-power; Middletown Electric Light Co., Middletown, Conn., 75 horse-power engine; Oneco Manufacturing Co., New London, Conn., two 60 horse-power engines; Bates, Reed & Cooley, Broadway, New York, one 40 horse-power engine (private plant); Dunham, Buckley & Co., Broadway, New York, one 40 horse-power engine; Grinnell Manufacturing Co., New Bedford, Mass., one 150 horse-power engine, incandescent for mill; St. Louis Electric Illuminating Co., St. Louis, Mo., one 60 horse-power engine; Knoxville Electric Light Co., Knoxville, Tenn., 85 horse-power; Marlboro Electric Light Co., Marlboro, Mass., 50 horse-power; Freeland, Loomis & Co., Washington street, Boston, plant for store.

Hale's Honey,
The great cough, throat and lung cure, 25c., 50c. and $1.
GLENN'S SULPHUR SOAP heals—beautifies the skin; 25c.
GERMAN CORN REMOVER kills corns and bunions; 25c.
HILL'S HAIR AND WHISKER DYE, black and brown: 50c.
PIKE'S TOOTHACHE DROPS, will cure in one minute; 25c.
DEAN'S RHEUMATIC PILLS are a prompt, sure cure; 50c.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED DECEMBER 8, 1885.

Frictional Electrical Generator; Philip Atkinson, Chicago, Ill..... 331,754

Consists solely in minor details of construction and forms of the individual parts.

Dynamo Regulator; Dynamo; Dynamo Regulator; Dynamo Armature; Benjamin F. Orton, East Saginaw, Mich.

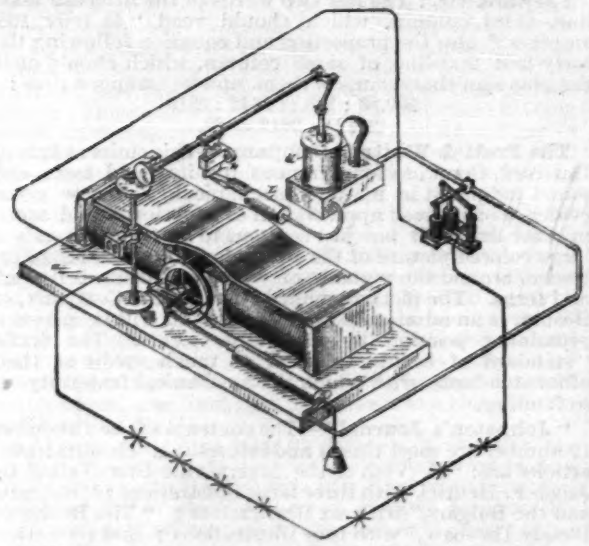
(1), 331,814; (2), 331,815; (3), 331,816; (4), 331,818

The first is shown in the cut and will be understood by those versed in the art.

The second consists of a dynamo-electric machine or motor having a four-pole field-magnet, detachable pole-sections adapted to fill the interval between two adjoining poles, whereby said magnet may be converted into a two-pole magnet or reconverted into a four-pole magnet at pleasure.

The third consists of adjusting mechanism for a dynamo-machine, of mechanical reversing devices, and two magnet-coils or sets of coils adapted to act in opposite directions upon a movable core or cores connected with the reversing mechanism, each of said coils having a portion of its core fixed and connected with a magnetic yoke-piece.

The fourth consists of an armature cylindrical in outline, having its coils or bobbins separated at their outer circumference by iron plates set on edge upon a common base or



331,814.—REGULATOR FOR DYNAMO-ELECTRIC MACHINES.

shoe that is applied to the armature core or body, and is provided with the radially extending plates, through which fastening-pins pass.

Making Magnets Self Keeping; Erva B. Silliman, Bridgeport, Conn..... 331,830

Consists of a series of magnets arranged side by side with their poles alternating, of mechanism—for example, a shaft having sockets arranged thereon at an angle other than a right angle to said shaft—whereby the magnets may be supported in their operative position or may be armatured by placing their opposite poles in contact.

Electric Motor; Warren S. Hill, Boston, Mass.... 331,880

It is clearly shown in the cut.

Circuit Controller; Lewis H. McCollough, Richmond, Ind..... 331,986

He provides within a box signals which can be operated by specially formed keys, as shown in the cut. The device inside the box is a derived invention of that shown in patent granted to him April 28, 1885.

Underground Conduit; Eugene A. Street and Randall W. Fleming, Kansas City, Mo..... 331,918

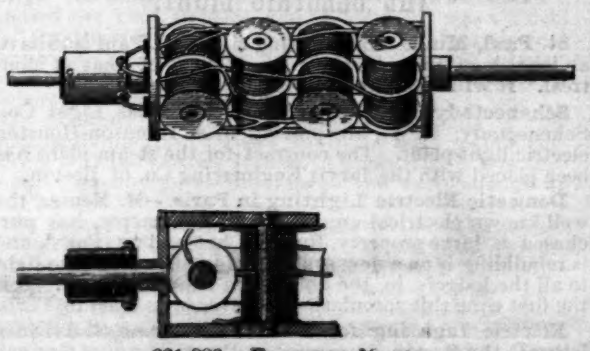
Comprises a sectional conduit-trough having a coupling-flange at one end of each section, with a sectional cover removable in sections, having a beaded projection from the under surface of said flange and near its end, a groove made in the upper surface of the coupled end of the next section of cover and near its end to fit the aforesaid beaded projection, and two parallel grooves in the under surface of each section of cover at its side to fit the walls of said trough and to form eaves

Combined Engine and Dynamo; Jonathan H. Vail, New York, N. Y..... 331,924

The elements and their general disposition, as patented, are shown in the cut.

Telephone Exchange; William S. Ford, Denver, Col..... 331,955

Consists of an apparatus for making connections on a switch-board between a line strip and a connecting strip by means of a current of electricity controlling or acting upon the connecting strip, and another current operating electrical devices which control or act upon the line strip, these currents being sent to the switch-board from an op-



331,880.—ELECTRIC MOTOR.

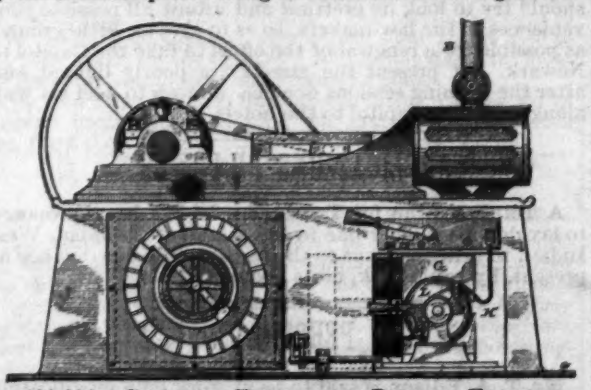
erator's table having upon it contact points corresponding to and in connection with the electrical devices at the switch-board.

Multiplex Telegraph; David H. Keeley, Ottawa, Ont., and Aaron A. E. Garvey, Montreal, Quebec, Canada..... 331,975

Consists of a main line relay and two local relays under control of said main line relay, the first of which local relays controls a local sounder, in combination with connections, whereby a maximum or a minimum current causes the local sounder to act, while an intermediate current causes the second of said local relays to continuously make and break a circuit through the first-named local relay, so that the sounder will not act.

Electrical Transmission of Power; William L. Schlesinger, Philadelphia, Pa..... 332,009

The system comprises a generator having its field magnets wound in sections, a circuit-reverser for said sections, having a movable handle or lever, a derived or shunt circuit from the generator, having a circuit reverser and an electric motor, power-transmitting devices interposed between the armature-shaft of the motor and the movable handle of the circuit-reverser for the generator field-magnet sections and between said shaft and the generator commutator-brushes, and a shunt or derived circuit from predetermined points along the line-circuit having an elec-



331,924.—COMBINED ENGINE AND DYNAMO ELECTRIC MACHINE.

tro magnet provided with an armature in engagement with the movable part of the circuit-reverser in said motor-circuit, whereby the strength of the generator field-magnets is automatically controlled to maintain a constant electromotive force at said predetermined points on the line-circuit.

Telephonic and Telegraphic Signal System; John A. Seely, New York, N. Y..... 332,012

Includes a signaling device, comprising concentrically arranged contact strips and buttons, and circuit-completing pieces, some electrically connected and others insulated from one another, and all connected to the same handle.

Telegraph Insulator; Benjamin N. Deblieux, Bay St. Louis, Mississippi..... 332,061

It is composed of two longitudinal sections placed together to form a joint in the middle and retaining the wire between them, with devices for holding the sections together and securing them to their support.

Automatic Circuit Breaker for Burglar Alarms; James B. Yeakle, Baltimore, Md..... 332,130

The object is to cause an alarm at a central office or other distant place whenever the premises guarded are burglariously invaded, and also to cause a signal to be given at stated intervals at the central office or other distant place, for the purpose of indicating that the alarm circuit is intact, and it consists of a main electric circuit connecting a place to be guarded with a distant station, of an automatic circuit-breaker in the main circuit, a time mechanism arranged to trip said circuit-breaker into action at predetermined intervals, an electro-magnet disconnected from the main circuit and arranged to be included in a local-battery circuit, and tripping devices controlled by said electro-magnet for tripping the circuit-breaker into action independently of the time mechanism.

Electric Arc Lamp; Thomas L. Willson, Ilion, Assignor of one-quarter to James Brady, Brooklyn, N. Y..... 332,178

One magnet acts as the armature to the other, and they

331,986.—CIRCUIT CONTROLLER.

are arranged to clutch the carbon-holder directly between them at one set of poles, while the magnets are hung at the other set of poles by toggle-links in the lamp-frame, so that in the action of the magnets the lower poles are first attracted together and clutch the carbon-holder between them, and the upper poles being then attracted they act, through the intervention of the toggle-links, to lift the magnets bodily a short distance, and thus raise the clutched carbon-holder, and thereby produce the separation to form the arc. The reverse action for feed is accomplished, chiefly by repulsion between the magnets, due to an opposite polarity of greater power produced in the armature or shunt magnet by the increase of the shunt-current.

Telegraphic Service System; Mortimer Duperow, Washington, D. C..... 332,198

Consists in establishing at each station a telegraphic sounder included within a normally closed circuit containing all of the other sounders, said circuit being adapted to be automatically and continuously broken and closed by a circuit-breaker or its equivalent operated by a suitable motor. The makes and breaks produced by the circuit-breaker are, to heighten the effect, preferably in imitation of the Morse alphabet and the continuous and well-known clicking of the sounders in the various places of resort serves to call the attention of those present to the fact that there are at hand telegraphic facilities. At each sounder he proposes to locate a call-box included in a circuit extending to a main or branch office, where it operates a suitable annunciator in the ordinary manner. He also places in prominent position near the sounder and call-box a tablet of message-blanks, whereby the persons telegraphing may prepare their messages during the brief interval ensuing between the time of using the call-box and the arrival of the messenger.